585 Engineering Library
Vol. 43

OCTOBER 1917 No. 176

United States Naval Institute Proceedings

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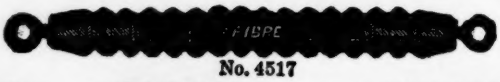

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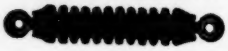

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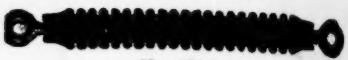

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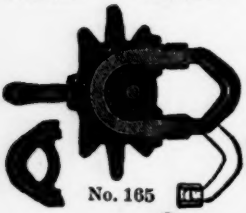

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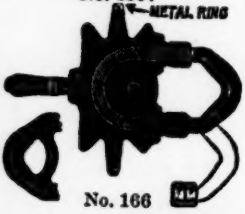

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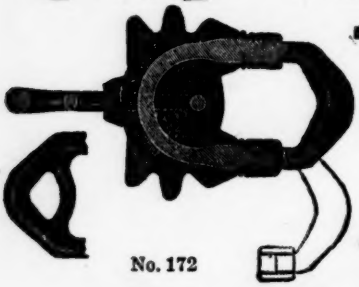

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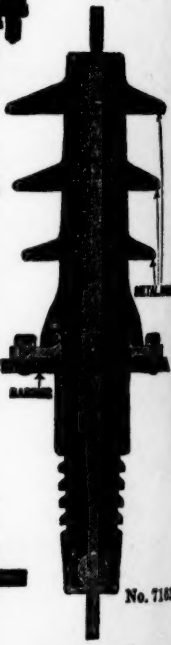

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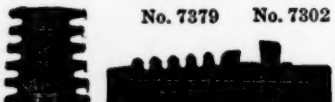

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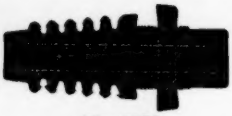

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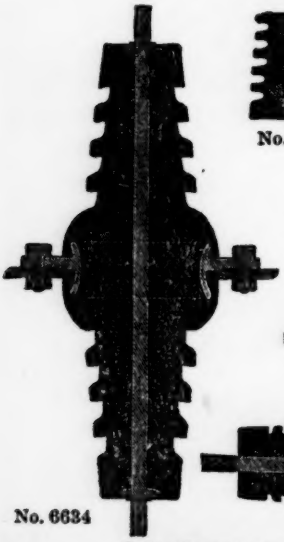

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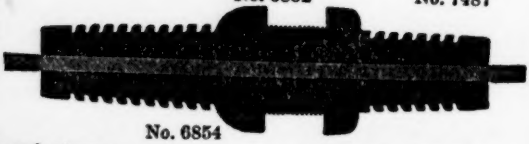

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Vol. 43. No. 10 October 1917 Whole No. 176

United States Naval Institute Proceedings

PUBLISHED MONTHLY
EDITED BY J. W. GREENSLADE

U. S. NAVAL INSTITUTE
ANNAPOLIS — MARYLAND

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The Lord Baltimore Press
BALTIMORE, MD., U. S. A.

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MOST NORTHERLY CAMP ON POLAR SEA. LAT. 82° 30′ NORTH; LONG. 108° 00′ WEST

UNITED STATES NAVAL INSTITUTE PROCEEDINGS

Vol. 43, No. 10 OCTOBER, 1917 Whole No. 176

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ARCTIC DUTY
WITH THE
CROCKER LAND EXPEDITION
(CONTINUED)

By LIEUTENANT FITZHUGH GREEN, U. S. Navy

THE POLAR SEA

I have spoken repeatedly of the science of arctic travel. The term is not an exaggeration. One must have tried to camp in wet weather before one can realize how easily pouring rain penetrates the tightest garments and tents. Difficulties are trebled north. Cold numbs fingers and body against rapid efficient work. Snow ten times more than rain can creep among the interstices of stitch and toggle, and in a fiendish way find the warm bare skin which shrinks from the bitter touch in hysterical horripilations. Darkness annihilates vision; and what this means when hunting for a white candle dropped in white snow on a black night I dare not publish.

As it is with camp so is it with the campaign. Advance in a straight line over sea ice, with no prospect for game, is an absolutely known quantity. This was Peary's problem. A stout rugged sledge with white oak frame and steel runners weighs at least 100 pounds. Ten picked dogs are the proper number for a long trip, why I shall describe later. Driver can exist on two pounds a day, one of hard bread and one of pemmican. I say exist, purposely. I am not yet so spiritual as to designate life, even the

divine spark, unless augmented by three squares a day. Team and man must then have 12 pounds per day or 600 pounds for 50 days. Adding 100 for each sledge and equipment brings the total to 800 pounds. We allowed something less than 100 pounds per dog and got along fairly well. Thus may a man travel 50 days without support.

For our proposed trip support was necessary. The base was at least 600 miles from the supposed situation of Crocker Land. Allowing an average of 20 miles per day, (Nansen made about five to nine. Peary 10 to 17) and one day in five for bad weather, showed that 60 days was the inside limit. But we must not go the limit for several reasons. We could not absolutely count on game in Ellsemere Land. Of conditions there and on the ice cap we knew little except from the conflicting reports of Sverdrup and of the Eskimos. Finally, when once we reached Cape Thomas Hubbard 400 miles away, our troubles were only begun. What evil impediment the Polar Sea would hold no man could guess. By word of all who had traversed its chaos of pressure ridges and tumbled bergs the outlook was not encouraging. In other words 400 miles from home, after climbing and passing several glaciers and a crevassed ice-cap, after finding a new pass through mountains thousands of feet high, and through snow which seemed to us nearly as deep, we must stand on the shores of the Polar Sea fresh and ready, and gird ourselves for a 300-mile dash out and back. Dash is a good adjective for the situation.

To accomplish this, regular supports and advance parties must be had and a campaign planned in the early winter. Campaign is military only by priority. Men fought each other before they took to fighting ice. By preference and verity it is arctic. We studied our maps and charts as no general ever did. We not only measured marches, distances, altitudes, but we observed the lay of the land for wind directions, upon which hang drift and depth of snow. We put together what geological data we had, following general land features in order to avoid choosing fiords or mountain defiles sure to deviate from the general direction of our destination. Where Sverdrup and Peary agreed upon certain plateau limits bounding a depression, therein might we find a broad highway of glacier and glacial lake. Where Schei marked a backbone of rigid gneiss cutting soft sedimentaries and standing down knee-deep in the white sound, there could we count upon

wicked tide-rips under the ice, tearing and lashing at the heavy inlet floes, fomenting quarrels between them and the cowering reefs, until a whole bay was devastated by huge ice blocks ripped from the mother sheet and tossed wildly on the horns of sharp ledges.

In the early spring darkness such tide-convulsed areas of heavy ice often threaten the success of a whole party. Hayes lost a winter's labor this way. Forty years before us he attempted Smith Sound in March. Thirty-one terrible days were spent in crossing. In contrast, six times we crossed in 1914 taking not once more than 12 hours. Our success sprang from the discovery of a smooth ice fringe bordering the rough main pack. Fortunately this held until our return in May. It isn't just the bare impassability of such spots which counts. On the Polar Sea we cut our way through gigantic walls of such riotous disorder that MacMillan once turned to me in the despair of exhaustion and exclaimed, "Good God! I feel like an ant in an ice cream freezer!" Indeed, men have travelled where few creatures besides ants could travel. But what really defeats an explorer are the precious items of his plans: time lost when every day should add its prorated miles; sore feet of dogs when every dog out adds 10 to 30 pounds to each other dog's load; sledges smashed when repair material is hundreds of miles away; whips snapped, boots ripped, clothes-bags cut, tempers lacerated—these are the reasons we feared rough ice. So we pored over our maps and cross-examined our men until old Panikpat finally advised us to worry less, "for after all," said he, "it is a great deal Torngatsuaq (the Almighty Devil) will have to do with your travel." After three years of sledging we concluded there was a lot of truth in Panikpat's philosophy.

Having agreed upon a route that seemed to present the best opportunities for direct and rapid advance, our next step was to estimate the position and size of provision caches. Past expeditions have established the value of smoothing the way for the party which will be called upon to make the final effort. MacMillan aimed to put two white men and two Eskimos at Cape Thomas Hubbard, each with his own team and all having travelled light over a broken trail from Etah there. This necessitated several trail-breaking and food-carrying groups. In rough about 30 sledges could do the work. But we did not have so many

available in the first place; and, secondly, only five white men were there who could command divisions. So vital was every element in vanguard work that we dared not trust native contingents alone. The only solution was to lay out a series of depots along the line of march and relay from these to points well in lead of the main party, who until the very end should bring up the rear. That was the theory. How well it worked out you shall see.

To Dr. Ekblaw and me came the honor of the first trip north. I was delighted at the prospect. Ek had proved a thoroughly enjoyable fellow on every sort of work; and his popularity and success at the University of Illinois showed that our esteem was well founded. Although professing to be a cut-and-dried man of science, his instincts were keenly adventurous. His academic work had been supplemented by summers with the United States Geological Survey and with the yearly expeditions of Yale men to little known parts of our American mountains. Ideas for future attacks upon the strongholds of the Kaibab Plateau and the Olympian Peninsula fermented daily in his capacious brain. Little had he not learned about the sea and the land and the creatures thereof. Such a man must Darwin have been when the astounded master of the Beagle exclaimed, " and what you don't know now, you sure will soon! "

With another man of this caliber I might have been at a disadvantage. But Ek's pet aversion was ignorance, and he sought to enlighten all who came within the circle of his own brilliance, and that without the least hint of patronage. One thing comforted me. With all his broad back and football hardened muscles he could not pull an oar. A coal heaver with knitting needles could not have been more awkward than Ek trying to keep stroke in our whaleboat. At Battle Harbor he took me over the island and described generically every moss and shrub, each schistosity and fault. But when we tried a little boat drill, my self-respect returned.

Posterity I am sure will bear witness to Ek's indefatigable assiduity in the prosecution of scientific work. One little experience Jot Small had with him will illustrate his zest without detracting any from his future glory. The two became fast friends early in the fall. After working hours, and while autumn twilight still permitted afternoon walking, they used to make

short excursions into the surrounding wilderness. Brother John's glacier at the head of the fiord was a favorite resort. Following Agassiz's example, Ek hoped to measure glacial movement by means of iron rods ranged across the crevassed face in a straight line, afterward to be bowed by more rapid flow near the glacier's axis. Thitherward with zealous regularity set out this modern Humboldt and his would-be Dana—though if Dana's nose ever blistered and dripped like poor Jot's did after six hours along the frozen skyline, I am afraid the world would never have enjoyed certain dissertations on glaciology compiled by that good man, in a cosy study, from the shivering frost-fingered sketches of others.

On December 4 we checked over our equipment for the last time. Dogs and sledges came first in importance. So far only MacMillan used his own team for long trips. The rest of us practiced hard and hoped to drive when serious work began. Sledges had been designed before leaving New York and a well-known sleigh factory had cut the white ash parts to fit. Each man assembled his own sledge in the workshop at headquarters. A cold task it was. Our extra stove together with a number of other valuable articles had been drifted over before we had got straightened out in the fall. Consequently we were forced to work for hours with bare hands at zero temperatures. Ash is more stubborn even than hickory. Runners and uprights, though supposed to be well seasoned, had all warped. The only solution was to enlist the services of several Eskimos and have them hold each part in place until it was lashed. I remember that after several hours chilling effort I got mine finally together except the bolts. A mass of knots and turns held the curved strakes and cross bars. I went in to warm my hands for a final spurt. "That double runner is going to be a great help," I heard someone say. My heart went into my boots. In the dim lantern light I had overlooked the second set of runners and now must unlash and start all over again.

We had something of a competition over stove boxes. Venesta packing cases were cut down and converted into holders for the little blue-flame kerosene burners. Each man had his own pet design. Reduction of weight so far as was compatible with protection: to his end we devoted a great deal of experimenting not only for stoves but for instruments, clothing, and even oil

and pemmican tins. At any moment underway dogs may catch a bear scent and be off at top speed. They go wild, seeming to forget the heavy sledge is along. Suddenly crash!—the whole load capsizes, but making no difference at all to the crazy dogs. Chances are that something will catch. Away goes the lashing, and one by one the precious packages are strewn from Baffin Bay to the Pole. I have gone back miles picking up a knife, a cartridge, a boot—but in the end I learned. If snow is falling the matter is more serious. In any event clothes-bags, stove- and instrument-boxes, and the like, must be tough and strong.

Our garments were entirely native except the single suit of woolen underwear. Eskimo costume is remarkable for three qualities: lightness, warmth, and durability. My whole outfit in which I was able to travel and, by tightening a few strings, to sleep without a bag at 60° below zero Fahrenheit, weighed no more than does my uniform overcoat! Boots are of sealskin, hair scraped off and paper thin. They are loose fitting and have heel and toe thongs like a snowshoe. A draw string at the knee keeps snow out. Stockings from the arctic hare are soft as down. The dried parchment-like skin becomes tough and pliable with wear. Between the soles of boot and stocking is placed a thin insulating layer of dried grass. This must be changed every night on the march in order to prolong the period allotted to each set of footgear before drying is necessary.

Breeches of bearskin have been the fashion in cold countries since man killed the first bear. No other is so warm in winter by thickness, nor so cool in summer by the radiating quality of its snowy whiteness; and no other skin in the north can retain its hair through the worst usage as does bearskin. Last winter I had a pair of these breeches already six months old. For eight months more without rest I travelled, sat, fell, rolled, worked, walked, and slept in them. I could have worn threadbare a dozen pairs of woolen trousers in that 2000-mile football game with ice and rock and water. Not a rip nor a tear in all that time is a good record. The only treatment they received was occasionally in igloos after a particularly trying march when my whole outfit was soaking wet and I preferred real drying to the usual method by the heat of one's body. A native woman would turn them inside out and hang them on the rack over night. In the morning before I awoke she would take the stiff, dry skin

boots and breeches and chew them soft and pliable again. Lack of pliability is the trouble with such thick hide. I have known plumper men than I to soap their legs inside to prevent chafing. Drawers of course are a protection in a way but they used to dissolve, disappear, by ravelling out I suppose, after a few weeks on the trail. The last year we had none at all. Seams are another source of discomfort.

In place of an undershirt the Eskimo has one of birdskin. Thirty little auks or 20 akpas (murres) are required for a shirt. The feathers are next to one's body and are inconceivably warm. As a rule we avoided birdskins because of the great amount of native thread necessary, added to the utter impossibility of cleaning them in any way whatsoever. Outside the birdskin shirt came the *kooletah* of caribou skin. This also was of one piece with hood attached. To protect cheeks and chin a soft foxtail was sewn about the face. This roll becomes full of frost from the breath and must be beaten out continually to avoid freezing one's face by contact. In front and back were short cinch lines which might be toggled together and prevent snow from blowing up under the shirt in a blizzard and also while sleeping. Very often when caught by bad weather or when, as on the Polar Sea, weight means so much, sleeping bags are not to be had. Each sledge has a small piece of skin to keep snow out of the load it covers. These pieces are arranged together if one has a snow house; or, should there be no proper snow, in the open. The party of two or three men then sit side by side. An extra shirt, clothes-bag or anything of this sort is laid across all the feet. Next, each in turn having tightened his crotch cinch and secured the face line, slips his arms out of sleeves and crosses them inside the *kooletah*. By a twitch of shoulders one sleeve may be thrown up to protect chin and nose. Then all lie down together. Frequently Eskimos sleep sitting, but we found the practice too cramping for comfort, though occasionally that was the only way we could keep warm.

Mittens are of sealkin as a rule, though in very cold weather bearskin is used both for boots and mittens. The best hunters claim these are too hot. Several little points about the art of making and using of mittens we took months to learn. They must be very short, not much more than covering the knuckles. Then the *kooletah* sleeve may be very long and its trimming of

foxskin protects wrist and hand. The object of this is to have the mitten so small that many can be carried, and the sleeve so long that while barehanded work is being done there is good protection. There is a little ball of grass to be carried in one's hand at all times. As in the boot this absorbs body moisture and enables mittens to be worn several days. When mittens are taken off they must be laid on the sledge exactly as they leave the hand. Put on the ground they are swallowed instantly by some ravenous dog. They cannot be flattened out or folded, as they freeze like iron in a few seconds, and must be thawed by putting the warm hand in them.

December 5 having been set as the day of our departure, nearly everyone was up all night putting the finishing touches to whip lashes, harnesses, knives, guns, stoves and clothes. The excitement was great fun for our native friends who gathered en masse to help and encourage. Bedlam of babies and puppies was varied by concerted attacks upon our meat-shed by the dog-teams who well realized that they were to travel, and were keyed to the highest pitch every time a harness was fitted or a new whip tested on their furry backs. The climax came when Tooky's oldest child bit the head off a toy dog I had given her and swallowed it. Her shrieks rose above all other din.

We set off at 5 a. m. The December moon had come the day before and now rested comfortably upon the misty ice-cap. An arctic moon has a spiritual reality and beauty like nothing else in nature. She enters the black night with a kind of dignity, heralded by a soft glow in the south. There is no quick rise but a very gradual ascent as her great reddish disc rolls along the tinted gray horizon. Mounting into the sky she grows more luminous with the majesty of her elevation. Round she rolls for seven glorious days in a wide helical course about the frost-misted heavens. The vast white loneliness of the ice-cap is transfigured and basks in mellow light, while across it play the snow eddies like wraiths of the happy people among the bordering cliffs. Cliffs that were—for moonlight softens the ragged pinnacles and smooths out the wrinkles of ages except where white drift ribbons retouch the whole to artistic perfection. Seven days and darkness is driven to the edge of the universe, as cold before fire, as lie before truth, as hideous death before sublime faith. "White Man," said Ahdukahingwaq, "where-

fore dost thou rest thine eyes so long upon Sermilksuaq (the great ice-cap)? Too distant is the clean snow for trail; and too bright for spirits who dwell therein—beware White Man, so it is the old men gaze upon the sea, and, forgetting life, fall in—their souls to be stolen by the swift seals."

Five sledges formed our party, three in Ek's division and two in mine. Each man after collecting his team drove down the bank on which our little house squatted and halted just beyond the ice-foot. Here all loads were tightened and cases checked. Together we carried about 500 pounds of pemmican, 500 of oil, and the same weight of biscuit, milk, ammunition and sundries. As we were not yet sure of our route, teams were fresh and not heavily burdened.

The crack of Sipsu's whip rang like a shot through the still moonlit night. Before cliffs could take up the echo there was a volley. We were off. Shouts of drivers, singing, popping lashes, and thumping hum of runners thrilled me like a call to battle.

Foulke Fiord opens into Smith Sound which at this point is about 35 miles wide. The suction of heavy tidal currents keeps the ice in motion through the winter. We were forced to skirt the coast for at least 20 miles to the northward where solid floes presented a fairway to Ellsemere Land.

We stopped at noon to give the dogs a rest, repair whips, and restow some of the loads. Although the sun had been gone nearly two months, there was a faint glow in the south as it crossed our meridian; but its sickly pallor was a wan competitor before the resplendence of our high moon. Ten miles of walking and running and heaving on upstanders had sharpened our appetites to a painful degree. But rations were designed for only morning and evening meals, without any account for midday weakness. Sipsu proved a lifesaver. Rummaging in his sledge bag he drew out a slab of *niqko*, narwhal meat dried on the rocks in the sun. This delicacy is black like a large plug of tobacco and of nearly the same consistency. Many a time in that famined country did I chew its raw dried ration into juicy redness, until, by the fat between its tissues, it slipped satisfyingly into the ravenous cavern of my empty belly.

Through the long afternoon—it might as well have been night with the circle of yellow light and the darkness just beyond—we fought our way against a bitter northerly wind.

Later we found this wind a perpetual denizen of Smith Sound. Open leads off Cape Alexander steam straight up into a water sky, sucking out of the Hall Basin refrigerator a constant stream of cold air. We sheered over under the cliffs just above the Cairn Point of Kane, looking for a good place to camp. Two requisites for choice were snow for an igloo and fresh-water ice for cooking. By a shallow gully the swirling drift had packed a hard bank of fine, firm snow, and nearby the same wind had swept clean among the rocks a shallow pond.

Two igloos were necessary for our party. Sipsu and Toiteak were chosen *nalegaqs* or head architects, and at once set to arranging the blocks the others had already cut. First on a level place an ellipse was laid out, flattened at the entrance end. The last two blocks in front were set up and beveled so that a second row of blocks began by an easy slope. Rows inclined inward more and more, until, by the time the fifth one was reached, only a small opening remained. Into this is fitted the keyblock of the arch, requiring great skill and delicacy; and which, once in place, completes the whole. Immediately chinking is begun on the outside. So soon as the inverted snow bowl is tight, kerosene lamp and candle are lit within. Heat softens the inner surfaces until, by the burden of the supported snow, the whole shrinks to a compact and uniform block and freezes so. Such perfect insulators are the 10-inch walls that, when several men are sleeping in a tight igloo, just their body heat creates a marked difference between indoor and outdoor temperatures. Pound and roar of gale and hiss of snow are muffled to a soothing faintness.

Two houses done, side by side, we beat the snow from our clothing, skinned out of our *kooletahs,* and crawled in through the hole that served as a door. Already a bucket of tea was on and a tin of luscious pemmican announced its presence by the unmistakable odor of burnt raisins, of which a small quantity had been added to offset the constipating effect of tea. Sipsu rounded off a snow block and, as he fitted it into the doorhole, remarked that tea and pemmican were very excellent food no doubt, as everything the white man has is to be praised; but that to-morrow night, "we shall eat of the heart of a bear and grow strong!" As an extra precaution we took our loaded guns inside to be ready for any curious bear prowling about to leeward of our teams.

After the hard day we slept like logs despite 54° below. Sipsu and Toiteak had no sleeping bags at all. Ek's and mine came only to our waists. *Kooletahs* protected the upper portions of our bodies. To be a little cold is to be a little wakeful, and one can then examine teams and sledges through the peep-hole to discover and circumvent canine warfare and thievery, two constant annoyances of dog travel. We carried watches strapped to our bodies but the Eskimo chronometer proved most efficient in dark weather. A native simply marks the approximate position of Arcturus on his igloo wall, measures one quarter around to right and punches a peep-hole. Arcturus is the brightest star of the northern constellations and does not set. Furthermore according to native legend, it is the only star which does not upon occasion leap out of its place and visit other stars; in other words it stays home of nights.

Morning came cold, still, and brightly moonlit. We were packed, lashed, and off in record time, setting our course across Smith Sound for Cape Sabine. Bears to-day was our one thought. We were not disappointed. Two miles out the leading team swerved. Instantly came the cry, "Nannooksuaq!" (a bear!) Excitement and uproar of dogs and men were enough to wake all the devils of the north. I saw the trail. It was like that of snowshoes. On either side of the huge prints were smaller ones. "Bilahperdouq pingasuni," screamed Ahwelah. "Three cubs," I repeated to Ek. Frost and tears blinded me. Then I saw four bears, great yellow shadows, plunging through drifts and over hummocks as if winged. Sipsu seized his traces, drew them in, and, with his long knife, freed two dogs already famous for their bear hunting. Four more slathering wolves dashed from other teams. In a moment they had caught the old bear who would not desert her young. She reared on her hind legs, gigantic in the pale light. A roar of anger burst from her. My heart jumped at the ferocity of the hoarse blast which reverberated from the berg she had chosen to back. One cub slunk behind her. The other two made off pursued by a dozen bloodthirsty hounds. Their cries of terror pierced even the uproar of the pack now closing on the mother. She spun about and sparred with astonishing agility. Two dogs jumped a fraction of a second too late and were ripped clean open by her dagger-like claws. Ek raised his rifle waiting for a clear shot. The

action seemed a signal for such venomous fury in the beast as even the snapping dogs had not been able to foment. Erect, gnashing her teeth, and foaming, she advanced. Ek did not move. I saw his mitten drop. He fired. For a long second the flame stunned the dogs. The bear clawed once and bit at her breast. Her head fell limp; the massive shoulders shrunk; and she collapsed.

Then the fun began. Seven teams, four score famished dogs closed in. Five minutes and they would have torn the huge carcass to pieces. We fought to save the skins. Whipstocks, clubs, gun butts, any weapon at hand was used to drive back the raging pack. Quarters were too close for whips; voices of no avail in the uproar. Real battle it was, seven against 70. As the bloody circle opened whips came into play. One by one we singled out our teams and hitched them to the ice.

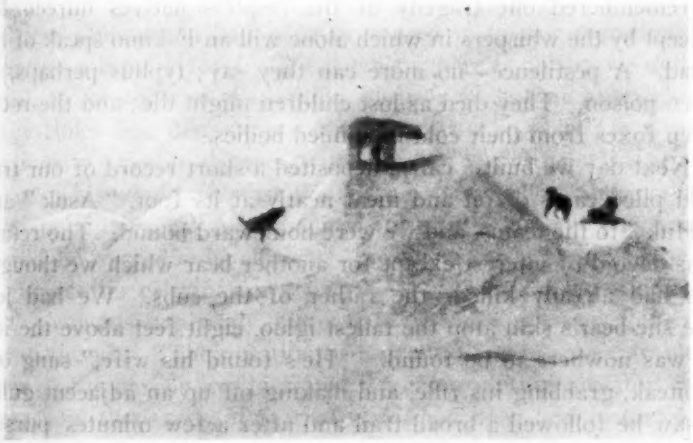
Skinning and butchering took an hour. To my surprise the men worked barehanded. Long *kooletah* sleeves protected all but their fingers which were continually buried in the warm flesh. Allowing 200 pounds apiece for the cubs we had now at least a 1000 pounds of extra weight. Without a dissenting voice we dumped our pemmican and oil on the ice, and, having fed each team its share of the entrails, returned to last night's camp. "This night," said Toiteak to Ahwelah, "shall the white men first taste of the white bear; and they shall by many trials learn to sing our bear song." I don't know about learning it but many trials was certainly the case. No less than 500 times did our blood- and grease-smeared gang chant what they call their "bear anthem."

Next morning we all suffered a hangover. Bear meat raw and cooked, cold, hot, greasy, and every other way may be all right as a steady diet. But gorged Eskimo style after a kill, it is disastrously indigestible. The dogs too were lazy and replaced their usual quick trot and canter by a lumbering waddle.

The slow miles seemed interminable. Cape Sabine lay shrouded in fog and drift while we travelled in peace the white waste of hummocky floes. Several times we crossed footprints of the four bears killed yesterday. Pewahtoq stopped twice to examine the trail. He called Sipsu. "The old one, perhaps," I heard him say. At that moment the dozing teams sprang into life, and in the same instant were off. We dashed after them. Ahwelah

led us a mile. We saw him rise, crouch, and cut loose his leaders. We saw the bear. He seemed little concerned with the pursuit but loped away toward an iceberg which he mounted. My sledge capsized and caught in rough ice. Freeing the dogs I seized my rifle.

What a picture—inky blue sky and white expanse of glistening snow; a marble berg, hard, still, titanic—and on its back, outlined against a deep infinitude of space, the bear. Belonged here the stillness of death, curl of frost smoke, a lone sharp crack of immeasurable cold, without life—instead, like a mob in a temple, rioted our silly dogs. The bear sat immovable. Toiteak's rifle



A FAT BEAR ON A HOT DAY IN JUNE, THE DOGS ARE TOO HOT TO FIGHT. NO GOOD BEAR PICTURES WERE OBTAINED AS THE BEST HUNTING WAS IN THE DARK MONTHS

blazed. The White King died slowly, nobly—head resting on his broad paws.

We pitched our camp under the scarred ramparts of Cape Sabine. I could eat little and was too weary to join the gluttonous jubilation within. I went out, preferring to commune with the pale Aurora, and committed my fancy to the past. I stood upon the swollen bed of glacial detritus worn by long vanished glaciers from the cliffs above which had survived only in part the siege of time and cold. About me wind laid bare white shreds of sailcloth and fragments of wood. Here, 15 years before, Peary bore the agony of his frozen gangrened feet, while

his soul suffocated with the internal strife which rent his embittered little party. Just around the corner stood the rock walls within which Greely's 19 unfortunates perished miserably. A little farther along the grim and desolate shore one might see a pitiful cross which commemorates the mysterious death of Dr. Svensen. A thousand feet above me a wind crept and whispered among the crags. I shivered a little and moved to a bit of elevated rock whereon the drift could not conceal four small meat caches—at least so I thought. Kicking away one of the stones I made out a piece of skin held down by the pile. Without thinking I reached down and drew out—a shrunken, a naked, human arm. A wave of sickening horror and disgust swept over me—then I remembered one tragedy of the helpless natives unrecorded except by the whispers in which alone will an Eskimo speak of his dead. A pestilence—no more can they say; typhus perhaps, or even poison. They died as lost children might die; and the rocks keep foxes from their cold-mummied bodies.

Next day we built a cairn, deposited a short record of our trip, and piled cases of oil and meat neatly at its foot. "Asuk" and "Huk" to the teams, and we were homeward bound. The return was devoid of interest except for another bear which we thought we had already killed—the father of the cubs. We had left the she-bear's skin atop the tallest igloo, eight feet above the ice. It was nowhere to be found. "He's found his wife," sung out Toiteak, grabbing his rifle, and making off up an adjacent gully. I saw he followed a broad trail and after a few minutes' pursuit found him sitting breathless on the heavy skin at which the trail narrowed to double footprints larger than I ever saw again in the North. "So we find it often," Toiteak explained. "A female killed makes when skinned a fine bait for her male; who thinks perhaps" he chuckled, "it is some little game she would play by rolling up in a small bundle and not cuffing him when he carries her off." We were too worn out for hunting and turned in without bothering about the father of our family of skins. Next afternoon we reached home.

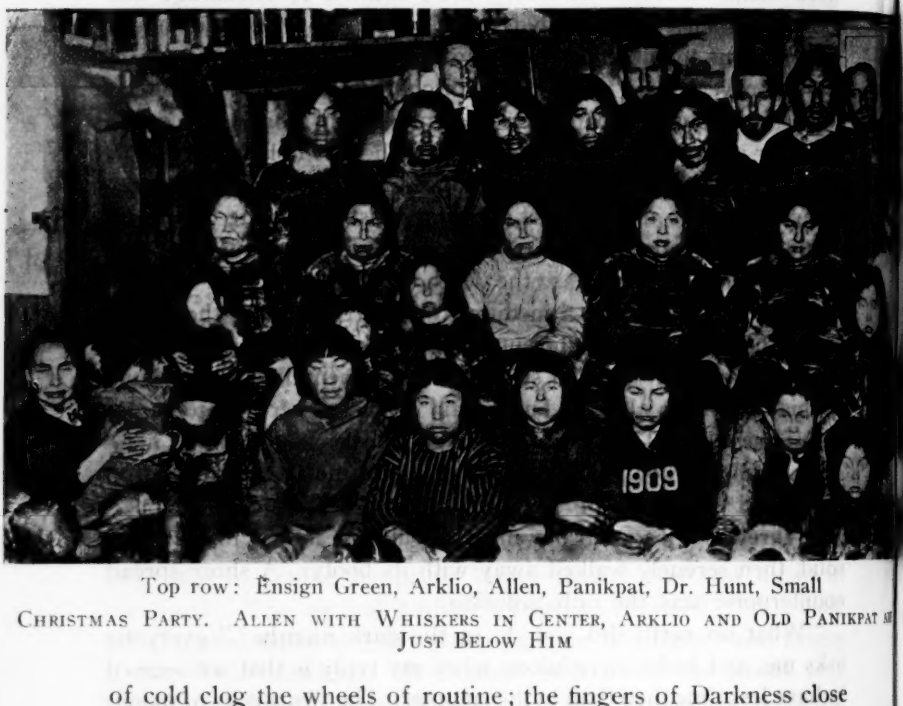
There was great rejoicing upon our return. Bear roasts and juicy bear steaks were wonderful improvements on the raw or parboiled savagery of our field cooking. Of course the others envied us—all except Allen who was too absorbed in his efforts to catch some of the wireless messages we thought were regu-

larly being sent to us from the Canadian station in Hudson Bay. About 4000 feet of best phosphor-bronze aerial was now aloft. At first it was planned to cut in any or all of three sections strung respectively to a cliff east of us, across the glacial gorge directly in rear, and to a pinnacle on the west side. We sought to obviate the absorption and consequent damping of waves by the relatively porous talus which lay upon the flanks of the cliffs. Our theories were doubtless well founded, as the gorge-strung line spit and rattled with static while the others were silent. Periods of heavy drift seemed to encourage this local disturbance, as though friction of the snow particles might be analogous to rubbing together of similar dielectrics. Brilliant auroras never failed to give us a discharge through the receiver.

These phenomena had been presented to us for investigation in rather a bizarre form. The earth's sphere is oblate, we understood, by centrifugal disposition of its mass. Our atmosphere, many times less dense, must therefore also be oblate to a proportionally greater degree, with equivalent flattening near the poles. This would decrease the depth of atmosphere and increase its state of tension. As a medium for electric activity the Arctic should be exceedingly efficient. Aerial reactions must there be of far greater celerity and strength. Fragmental results pointed to this conclusion already, but certain obstacles were yet to be got out of the way. The question of a ground became more troublesome as the harbor ice thickened. A large metal ventilator, iron pipes, and thousands of feet of wire, had been laid in October. Tide threw the ice upon our metallic rubbish, let the mass freeze solid, then serenely walked away with its booty. A shore-spread counterpoise was the only solution.

"What on earth did you do in the dark months?" everyone asks me, and looks incredulous when my reply is that we seemed to have less time then than in the summer. The two weeks of moonlight, every minute of them, were used for travelling, either laying out caches northward or gathering meat and skins and men from the south. Of the dark days remaining in each month some were expended in repair work after sledging, and some in preparations for the next venture north. Routine scientific work, records, writing and tabulating, seemed never to be more than barely up to date. When some extraordinary curse, such as the deceitful rascality of our tide gauge, fell upon us, all felt the

incubus of the extra attention it demanded. While Tanquary was bottling bugs and Hunt counting corpuscles, Allen might be rocking the whole shack with his 500 r. p. m. motor generator. Jot was sure to be stirring soup and sawing sledge bars at one and the same time, while a dozen embarrassed Eskimos contributed their dolichocephalic dimensions to MacMillan's ethnological notebook. As for me, I have known days when I was contented to have no more irksome duty than coal mining in our front shed or bean-mining back of the house. And through it all the demons



Top row: Ensign Green, Arklio, Allen, Panikpat, Dr. Hunt, Small

CHRISTMAS PARTY. ALLEN WITH WHISKERS IN CENTER, ARKLIO AND OLD PANIKPAT AT JUST BELOW HIM

of cold clog the wheels of routine; the fingers of Darkness close one's eyes and nip the flame from an hysterical lantern, while grinning Wind and Smother cry, "find your case of beans, thou puny Man!"

But we did progress. By Christmas a ton of depoted provisions were out. As much more fresh meat was in from the south, and skins sufficient for full outfits had been procured. Our Christmas party had been advertised some weeks previously in order to draw the men we expected to make up our sledge

caravan. Jot principally taught them the use of tools, which they learned with remarkable speed. A score of sledges were built. Solid oak sides and soft pine cross-bars were furnished to the natives which they lashed and finished to suit themselves. Thongs take the place of nails in this work, and no sailor or rigger in the world could do better than these unskilled savages whose vise-like teeth and strong short fingers are their only tools outside a long knife. Bow drills are little used. Holes for lashings are gouged with a sharp pointed blade, or on cold days shot through with a rifle. By New Year's day the gaunt skeletons of 18 sledges leaned against our roof.

January came with even more bitter cold, but days soon grew brighter as the sun approached our latitude. February 7 was set for the departure of the first party towards the Polar Sea. Our natives gathered with dogs and meat in order to start with strong teams. Two arrived from Cape York bringing news of an unusual journey to South Greenland, nearly 500 miles past the unknown terrors of Melville Bay. They mentioned a sickness which had been epidemic among southern tribes after having been visited by a whaler. Dr. Hunt inferred from their description that it was mumps. We soon enough found out that his surmise was sadly correct.

On the morning of the seventh the same mad confusion which always marked departure shook our little house like an earthquake. This time the intensity of occupation seemed more severe both on account of the number going and of the various parties which expected to follow on the four succeeding days. I went first with seven light sledges. At Cairn Point we found igloos and caches in prime condition. Our fear had been for the bears which come out of their winter trance about this time and go on a famined rampage for any sort of food. As heavy southerly gales threatened to break up Smith Sound I felt safe in delaying for 24 hours. Tanquary's squad rounded the Cape as we were boiling evening tea, and had a time of it heading off their racing teams which made for us in a mad rush when they scented our opened bear cache. Next morning the 12 sledges moved on together. Thick going and darkness delayed us. Without our knowledge several men lightened their loads on the ice before reaching Cape Sabine. Of course we were furious at the discovery but one cannot lose patience at an Eskimo. Ek caught

us the next night and did not forbear to show his disapproval of our apparent lack of push. He soon enough met it himself.

Thenceforward an evil fate guided us. Deep snow and rough ice impeded sledges and smashed many. Dogs unused to pemmican sickened and several died in convulsions. Nothing discourages an Eskimo so much as death among his team. He puts it, "so might one drive one's team over the brink of a cliff—the leader forward dropping first, but promising in his own death the death, soon to come, of his master—riding blindly just behind." Worst of all was our failure to find snow for igloos. We had no tent and the makeshift windbreaks we patched together out of our skins were poor protection against the sifting snow. We slept sitting or half lying, and without bags. No igloos meant no drying of clothes, as the sun was not due for several weeks. During one march enough frost collects in boots and mittens to require a night of drying in an igloo. The breast of my shirt contained a large pocket in which I carried a water bottle during the day—no liquid being available save night and morning tea. At night I put my bottle away and spread my soaking mittens and matted hareskin stockings upon my stomach, and filled the pocket with grass. I was surprised at the success of this method. Eskimos count much upon the stove of their bodies. Wet *kooletahs,* shirts, and other gear just out of a slopping sledge bag are invariably body-dried on long traverses in the sunless night. "See the dog," they say; "on the very cold and the very dark days he plunges by accident through the ice, climbs drippingly out; then like smoke from fire the congealing water leaves his skin." I must admit though, that a poultice of clammy skins on one's breast and stomach are not conducive to peaceful slumber. Poor sleep in hard travel is very exhausting, as we soon discovered after several iglooless days.

Another setback brought our troubles to a climax. Etukeshuk developed mumps. Next morning two others followed his example. They were positive it was the hand of the devil and urged us to contemplate these earlier warnings lest his full wrath descend upon us. Though we did not believe travel would seriously affect them, this devil argument was borne out by the mumps "going down." The victims took especial pains to depict their tortures to the others who had never before seen any such evil disorder. We were now at the mouth of Flager Fiord about

100 miles from headquarters. Our 20 Eskimos agreed upon the necessity of returning. Old Ootaq who had followed Peary for a quarter of a century, even to the Pole, and knew all the chances a white man dare take, was chief agitator in the strike. He did not hesitate to tell us what dangers and hardships lay across the Ellsemere Land glaciers, "no meat, no igloos, only wind and cold such as even Eskimos cannot endure. Back then let us go to your warm house with its many joys of food and music." We reminded him of the joy and the music of his fat wife, and suggested he go back and help her sew. At which he flew into a rage and beat the head of his off dog into a pulp.

MacMillan's arrival put an end to the discussion. He took in the situation at a glance, and therein displayed a true leader's ability. Eskimos sick and unwilling; dogs worn by bad going and insufficient food; and white men not yet experienced enough to take the proper amount of responsibility. In ten minutes he made up his mind. "Return and reorganize," he ordered.

I was enjoying the experience of it all and volunteered to remain another day with Dr. Hunt who must tend the helpless Eskimos still unable to walk. Mt. Cary presented an inviting climb just two miles south of us. It took me a half day to reach the summit, but the view paid for my trouble. I became overheated on the way up and nearly chattered my teeth out while I built a cairn and wrote a little record in the wind on top. For more than a week our spirit thermometers had not shown warmer than 53° below zero.

We profited much by this first failure which had afforded an excellent opportunity to become acquainted with our men and to appreciate the difficulties of protracted sledging in painfully low temperatures. Out of the original 25 drivers we selected 10 who had exhibited the most discernible loyalty in the crisis at our last camp. We provided them with food and ammunition for two weeks walrus hunting through the ice at Peterawik. There could they feed up dogs and men, and at the same time give the women a chance to repair old clothing and sew new. At headquarters we went over every detail of our equipment, eliminating a great deal which had proved useless, and amplifying a number of items we saw now to be indispensable. We sewed canvas bags for the pemmican exactly the size of the sledge deck. When filled they made an excellent ballast for the load.

I cannot recommend them too highly for any travel which requires the transportation of a large number of small packages.

On March 10 our expedition assembled again; and on the morning of the 11th made its second start. The weather was cold but a low sun in the south lent a new brilliance to the white snow fields and deepened the blue of the glaciers. Tanquary had frozen one of his feet in February, and Dr. Hunt's services seemed absolutely required at Etah. MacMillan, Ekblaw, and I, and eight Eskimos formed the new party. With empty sledges and large teams we sped across Smith Sound and down Hayes Fiord, reaching the scene of our recent failure in two marches. Here already were two tons of provisions, more than we needed for the reduced number of sledges, or at last more than we could carry.

Since the cold clear weather held we hastened on to the westward, taking the Beistadt Fiord of Sverdrup. As we swung between its narrow walls of cliff and glacier the going grew better and better until glare ice sung under our polished runners. Some day aeroplanes shall transport wealthy tourists to that crystal-floored inlet. They will motor through its 30 winding miles of rich red walls, which leap from the ice into the sky, save where the staring white névé plunges down in chaotic abandon, and drops in blue and boulder-pocked séracs to the ice level. And when suddenly a final twist presents the clean sweep of glacier which mounts to the ice-cap, each sensuous soul of them shall gasp in wonder at the spectacle.

The geology of it all is an open book: fluctuation of climate; recession of ice-cap; submergence of glacier-cut U-valleys to fiords; and finally the proof of biological mutation in shell deposits and Devonian fossils—until all sense of human time fades away. Still glaciers flow, and frost nibbles flinty gneiss before one's eyes. Coal beds effervesce and volatilize their hoards of ancient sunshine. Crusty trilobites swell and lengthen into reptiles, birds, and mammals. Every atavism drops away like an excrescence; until, upon the threshold of to-day, the ape form stands hairy and abrupt, with no inkling of the vast heritage that is his.

The problem which confronted us quickly put a stop to dreaming. Our party of 11 men and 100 dogs, together with about 6000 pounds of food and other equipment, faced a perpendicular wall of polished ice two miles wide and flanked by unscal-

able cliffs. At a point 40 feet above us the icy buttress sloped back slightly, and at 600 feet up rounded into the main glacial body which mounted at an angle of 30° to the ice-cap shimmering against a pale sky. We could well imagine cutting steps in the steely ice, but 48 hours at the most was all we dared spare for the job. We drank our evening tea a little despondently.

"A sleep," said MacMillan to Arklio, "and then what?"

"No sleep, perhaps," was the characteristic reply. "Not so often does the Almighty Devil permit cessation of his remorseless winds hereabouts."

"Will you cut steps?"

For an answer the sturdy hunter rose and, calling to Peewahtoq to bring his ice axe, walked along the glacier's front in search of a good place to begin. He explained that there must be room for two rows of steps, and not so much debris below; for, "someone shall fall from the top, and it is not pleasant to see a man dead by many lacerations." We agreed in English that the laceration part was not our greatest concern.

The two men were experts. Their double swing and chop notched deep, and reminded me of the way an Indian blazes trees without breaking his stride. Presently Arklio was at the turn of the wall. Peewahtoq then threw him a line which he tied about his waist. From there up he double-spaced the steps, the man below bending on six harpoon lines in turn, more than a hundred fathoms in all. Arklio shouted, his words chattering among the crags, "I can walk without steps now." Peewahtoq struck his thighs and grinned at me. "Make it fast," he yelled back. At which Arklio cut a ringbolt in the ice, secured the line and descended at a trot half sliding by the rope.

By this time the others were ready to tump, *i. e.*, carry small loads by neck lines over their heads. I calculated that their average lay between 80 and 110 pounds. Their short bull necks were capable of much more on a level, but hanging to the line unbalanced them and frequently the steps broke out. Dogs were hauled up bodily with the accompaniment of such clamor of howling protests as made the cliffs ring.

I had just landed my last can of oil at the top when I saw a sledge gliding across the ice towards home. Before I could realize what was happening another followed. Menik had deserted. We were not greatly surprised. "But why Tauching-

waq?" we asked the others. They smiled and Arklio explained. "Evalooq, Tauchingwaq's wife, is as the sunlight before his eyes, and Menik is a wolf." Two out of eight was a heavy loss. But desertion and mutiny are the explorer's constant fear.

In four hours everything was up to a lap in the glacier from which we could double bank the teams and drive. We boiled another pot of tea and served out an extra ration of pemmican Several of us fell asleep while eating. Nucarpingwah, I remember, had just put an enormous lump of food in his mouth when his head fell back and his eyes shut. For a moment I thought he must have heart failure from over-exertion. I was doomed to see extreme weariness seize a man in many queer ways before my dog days were over.

"How about crossing Ellsemere Land," queried, the other day, a man who has sledged. "That's a bit of a stunt, you know."

"Well, it's first an ice wall; then a glacier; another glacier; then the ice-cap. A thousand feet up, 500 down; 4000 feet up, 5000 feet down."

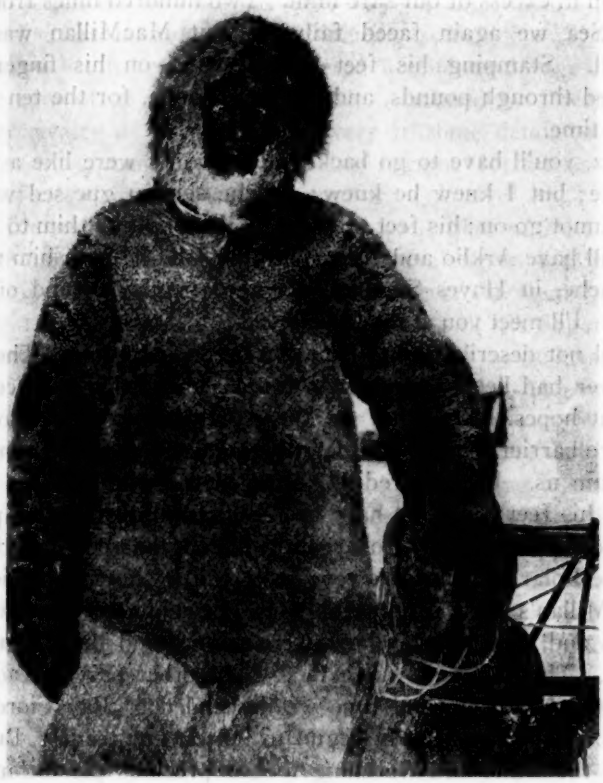
"Exactly"—he said in a low searching tone as if I were evading him. "But *in*-exactly—" He seized my shoulders. "Ah, tell me: I'm one of you; I'm scarred, outside and in. Just say the words. Dogs—cold—blood—ice—sweat; hours, endless man-eating hours; little knife of the wind opening a festered frost sore on your chin; great sobs of curses bursting the thick lip-scabs; your king dog swallows a new mitten, a precious whip lash—and you're too weak to *kill* him; up, up, up, forever up—with wooden feet which remind you of the gangrenous pus, amputation, death—thank the good God he gives us death at the end! Speak; I'll close my eyes; I'll hear again the cries and the wind, and the avalanches. I'll—"

"Stop, you've said it all—almost all."

"Food you mean? I know: passioned sensual seconds at the day's end. Tea like strong liquor, juice awakening food—"

"No—that too, of course. But no, another matter: the *beauty* of it! Brother of the Northland, can you forget? Pain was there to be sure, and far beyond our little mortal strength; ruthless wind; and cold which stunned every sense—but one: the sense which rose above hunger, fatigue, pain, hate and the fear of death—the sense of the eternal loveliness of Nature: we insects crushed by the Gods of the Tempest sauntering in their

garden; fathomless, echoing depths of the blue crevasses; gleaming ice torrents of the glaciers; white winding placid fiords between brooding granite masses, rising in bloody hues to the pale silence of the sky, in which a few stars watch serenely the endlessness of time!"



GREEN IN POLAR SEA. HAD NO BATH FOR MORE THAN TWO MONTHS, NOR HAD HE TAKEN OFF THE CLOTHES IN WHICH HE HAD BEEN SLEEPING. FACES BECAME ALMOST BLACK FROM FROST BITE AND WIND BURN

We crossed all told in three days; 40 miles; 5000 feet altitude; and a million crevasses, into which we stumbled and dragged ourselves out until fear lost its thrill. We lost our way. We were forced to repeat the ice cutting and tumping misery in order to descend. As near as we could judge we had reached Bay

Fiord which Sverdrup had marked when he came up this side and spoke of the impenetrable interior, which we had just crossed.

Then, as is the way with arctic work, plans fell to pieces. Ek disclosed a badly frozen foot. We had hoped for game; none appeared. We discovered our supplies could not now last beyond Cape Thomas Hubbard; and the extra fuel used on the ice-cap had been in excess of our safe limit. Two hundred miles from the Polar Sea we again faced failure. But MacMillan was not daunted. Stamping his feet and blowing on his fingers he mumbled through pounds, and miles, and men, for the ten thousandth time.

"Fitz, you'll have to go back." The words were like a death sentence; but I knew he knew; and he seldom guessed wrong. "Ek cannot go on; his feet are bad. Kiotaq will get him to Etah. You will have Arklio and Nucarpingwah, and be with him to the Big Cache, in Hayes Sound. We need pemmican and oil—oil mostly. I'll meet you at the Cape."

I will not describe the toil of that second crossing. The first time over had been a strain which we endured by the incentive of great hopes. Now that we knew each laborious foot of the great ice barrier, only a dull determination to die game remained to sustain us. Ek suffered as few men can with silence. The pain of his feet could not have been more cutting than the pangs of his disappointment. So ardently had he longed to do battle with the Polar Sea that this reverse was little short of tragic.

MacMillan's men, Etukeshuk and Peewahtoq, were matured hunters and drivers. My boys were young, and therein lay my success. They knew it was a race. The other party's lead was great, and by the second time we descended to Bay Fiord, the extra exertion had already begun to tell on our teams. But we held to the trail; and we clung to our precious pemmican and oil for our lives, eking out a daily ration from raw meat whenever possible. For a few marches we followed the trail of the others, and used their igloos which twice held musk-ox flesh. Once we could have hunted; and when I forbade Arklio to delay he turned his back on the distant herd and brained a dog with his axe. Embittered as the two were, never shall I again find their equal in persistent drudgery and courage.

These three weeks were in a way the most interesting of my whole arctic service. I was alone with two men my own age

and disposition; yet separated were they from what was really *me* by 4000 miles and 40,000 years. Their life was a sublimely simple fight for food and clothing. Mine was a cruel struggle of such labyrinthine intricacy that only the genius could be rich and none be truly contented save the shrewdest philosophers. Any average Eskimo might have wealth in return for the bare skill of practice. All normal ones have a comfortable plenty. And with them *enough* is a song-inciting sufficiency. I, on the other hand—I the cultured, pampered ascendent of ages, knew not the contentful joy of indifference. Imbued as I was with the ugly rivalry of a white man, every irksome detail counted; the most insignificant items of living became fortuitous assets toward victory over my fellow man.

Age for instance. I knew I was 25—was glad of it; I had a start on those older who were no further along in life than I. But my happy-go-lucky companions never gave the fleeting years a thought. Arklio could not count past 20—all his fingers and toes—but was positive he exceeded that number by at least four years. Nucarpingwah excused his ignorance by describing a certain favorite harpoon of his father's on which were notched each spring the children's ages. Came an unlucky day when the bull of a walrus herd carried off the shaft sticking in his huge back. Thereafter no birthdays were celebrated in the family. By dint of great mental effort the boy reckoned the harpoon's loss as occurring in the sixth year previous, making him also exactly 25.

A year to me was a task-space in which so much must be gained in the direction of my professional aims. To these carefree savages it meant but a few more skins or less, a series of hunts and feasts; a few famined months followed always again by hunts and feasts; a tribesman gone; another wife; a new baby—

Making camp, feeding dogs, and collecting water ice in the cutting wind consumed three hours—a long time when one has put his last bit of energy into the day's final spurt. Immediately tea was drunk, footgear was changed and necessary sewing done. The latter we usually deferred until held up by bad weather. On travelling days every minute of sleep was valuable, and a man rested best while still warm from the tea.

All three of us had ditched our sleeping bags, left them at the glacier to lighten our loads. I learned later what a foolhardy

trick this was. But absence of the older men seemed not only to remove restraint from our speech but from our actions as well.

At first we took turns sleeping in the middle, which place was of course the warmest. We had two pieces of skin to put on the ice under us and a canvas pemmican bag to cover our combined array of feet—all very cold and being banged up and down continually through the night. This feet-banging business was very irritating not only to the man who was forced to bring his feet back to life but to the others whom he invariably waked.

Arklio as a middleman was a jewel. But Nucarpingwah with his nightmares, and grumbling, and his extra supply of vermin was too restless for comfort. While we slept the middleman always gave the word to turn over. When curled up spoon fashion as closely as possible we found that this must be a simultaneous maneuver. Nucarpingwah was tractable enough while awake but in the middle of the night used to create the most exhausting mixups by trying to roll independently of Arklio and me. Painful as it was then, I must laugh now to picture the three of us lying worn-out and huddled in the cold cramped little igloo. With our arms out of their sleeves inside our *koole-tahs* we flopped helplessly against one another, gasping and groaning for all the world like three giant dirt-brown caterpillars suddenly cast together.

Further along an accident put me in the middle for some days. We had camped one night just south of the entrance to Greely Fiord when Nucarpingwah's team broke loose and scattered full cry on the trail of a bear. Before he could gather them again harnesses were ripped to pieces on nubbles and ice-foot snags. Our supply of spare line and trace material was about exhausted. We dumped out all our bags for a search. Arklio gave a shout of joy. From the innermost recesses of a kamik's toe he extracted a piece of *mataq* (narwhal skin) apparently put in as a surprise by his wife. Thoughtful, yes. But rather an indelicacy of imagination, I should say, to stow food in such a place.

Mataq is rather good when fresh, despite its greasiness. But it is so tough that even an Eskimo doesn't attempt to bite through; he simply chews and swallows. We were so pleased at the extra ration that our harness trouble somehow vanished. We patched

what we could and went in for the evening tea and pemmican, this time to be topped off with a ration of real food.

In spite of my hunger I found the tid-bit pretty rank. Even the boys admitted it was a little strong—which was admitting a good deal, for an Eskimo likes it ripe. It was, for twice in the night I awoke with cramps. When my team started a free-for-all I was glad to get up and vent my feelings on them. By morning I wished I had died in the night. The other two were not sick but I noticed they didn't eat much. As we often did, I stuck my lump of pemmican in the sledge bag. I was afraid to tell the natives how sick I was. They might spring their Almighty-Devil game on me and go home.

It took five days for the effects of that accursed mataq to wear off. The worst of it was that what I ate seemed to give me no nourishment. My teeth chattered so that the few fillings I had not already pried out on frozen meat were vibrated from their holes by the constant rattling of my jaws. I couldn't keep warm. It was mortifying. To the Eskimos I deprecated my white man's weakness. "Not so," said Arklio. "Wert thou weak thy sickness could not be so strong." Both insisted that I sleep in the middle until I felt better.

I dragged along behind and I think I should finally have given up had I not seen one of the boys leave his team and run aside. He turned towards me and sprang into the air waving his arms like a madman. It was our signal that one of MacMillan's igloos had been found, and the arms meant meat. I dragged up, but to my surprise found two of the most discouraged mortals I have ever seen. The igloo was blankly empty. Wolf tracks were everywhere with fox trails entangling them. Even the usual note was gone, except a shred on which I read the poignant words ". . . slaughter-ground where. . . ." This and tufts of musk-ox skin and hair half-buried in the snow were cruel proofs that somewhere in the vicinity there was a cache of meat for us—every minute being hidden deeper and deeper by the falling flakes. What had not been so laid away was apparently by this time in the bellies of the marauding pack. The situation was maddening.

We scoured the low beach and the white slopes behind. Light snow which had been falling began to drift. After several hours of fruitless wandering we gave up and munched our frozen pemmican in the cold igloo.

We all felt pretty disheartened over not finding the meat. My own feelings were even deeper. I realized that my part of the expedition had reached a crisis. Nearly 50 per cent of our teams had died or were too weak to pull. Every day we had more trouble in finding the trail, and of late only luck had led us to MacMillan's stopping places. He was anywhere from five to ten marches ahead of us depending on the going and our fortune with weather and open water ice-cracks. Did we miss him his own plans were endangered; and yet the supplies would be of no use to us if our teams were ruined. Without dogs we could never drag enough food to keep ourselves alive.

I tossed all night over the failure we faced. It all seemed so wretched after the effort we had made. Finally I came to a sort of decision. First, we must get enough food to the other party to ensure their success on the Polar Sea. Secondly, we must strip our sledges of every ounce of clothes and other gear not absolutely vital to life in order to save enough dogs to get back on.

Morning came, same old snowy blast and gloom of clouds. I explained the situation as well as I could to my men. They did as I told them without comment. At such times the native is glad to have a white man to think for him—he knows the white man isn't bluffed by the Devil. We cached about 200 pounds of oil and pemmican—thereby putting an end to all my hopes of going out on the Polar Sea. When I went to hitch up I found "Tutik" my spotted dog frozen stiff. He must have died while we were hunting for the meat.

Arklio led us across the neck of land towards the north. As we dropped down to the ice beyond, the sun broke through the clouds. A lull in the blow let us look about. What!—we couldn't believe our eyes: there was an igloo—just ahead. Could it be we had caught them? Where were their dogs? A dozen questions flooded my excited mind.

Pell-mell we tumbled down through the heavy drifts. A kick and Arklio plunged in. He thrust out MacMillan's note. "Plenty of meat and skins here in the igloo, and at least 30 dead musk-oxen up on the hill 500 yards north true." And the date was April 4. We were only three days behind.

In ten seconds I was ready to act. "You," to Nucarpingwah, "speed back and get everything we left. Take my dogs with you." I squinted through the snow-house door. "Arklio—make white

man igloo. Remember pictures?" I raked up all the native words I knew meaning fine and magnificent and comfortable. He took them all in and turned to like a Trojan. He beat out the great warm musk-ox skins. He disinterred the meat, juicy tenderloins, brains, and—oh wonderful word—tongues! my favorite dish (though we had no dishes, only knife and cup apiece). When we finished the igloo was a palace.

"Arklio," said I, "we shall eat a sledgeload of meat. And we shall sleep the sun once all the way around." He shook his head with a grin, then answered: "But who shall awaken us then?" He was right. From the way we felt, ten times might the sun revolve before we should wake up of our own accord.

We stayed there two nights and one day. I remember very little about it except that we simply loosed all our dogs and then ate ourselves into a trance that lasted 36 hours. At the end we broke out of our stupor only by an effort, pried the dogs loose from their scenes of gluttony, and lashed up for another try at the trail we hated so, yet followed with an ardor more than human.

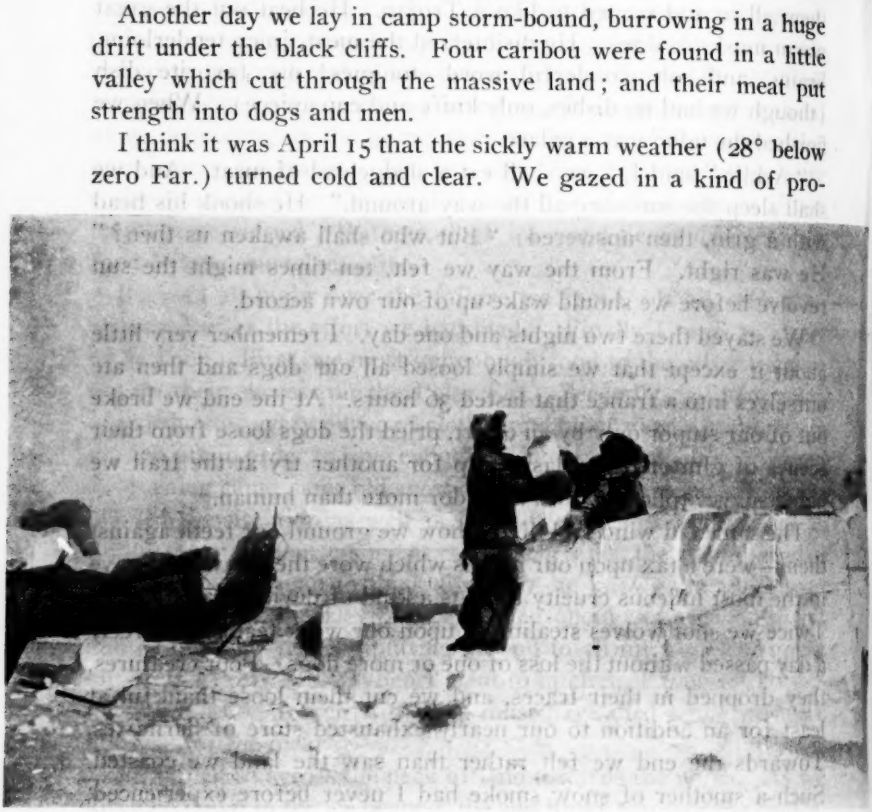
The same old wind and drift—how we ground our teeth against them—were a tax upon our nerves which wore them raw, and gave in the most hideous cruelty to dogs a kind of devilish satisfaction. Twice we shot wolves stealing in upon our weak teams. Scarcely a day passed without the loss of one or more dogs. Poor creatures, they dropped in their traces, and we cut them loose thankful at least for an addition to our nearly exhausted store of harnesses. Towards the end we felt rather than saw the land we coasted. Such a smother of snow smoke had I never before experienced. This saved us though, for while we plowed, MacMillan wisely halted; and on April 13 we came suddenly upon his camp a few miles from the cape where he had arrived only a few hours before. So many dogs had died that I had abandoned one sledge several miles behind, in view of the supreme necessity of bringing the leading party their vital supply of fuel and food. How we ever found them in that succession of blizzards through an unknown wilderness of ice and snow seems now a miracle. I think it was the fiendish intensity of our determination which did it.

To my great joy MacMillan chose me to go with him and his two men. My faithful pair he sent back with six skeletons of dogs, a gallon of oil, and two tins of pemmican—500 miles and

the ice-cap to go. But MacMillan knew their abilities. A close shave they had but a musk-ox kill saved them.

Another day we lay in camp storm-bound, burrowing in a huge drift under the black cliffs. Four caribou were found in a little valley which cut through the massive land; and their meat put strength into dogs and men.

I think it was April 15 that the sickly warm weather (28° below zero Far.) turned cold and clear. We gazed in a kind of pro-



MACMILLAN HANDING SNOW BLOCK TO PEEWAHTOQ, BUILDING AN IGLOO ON THE CHARTED POSITION OF CROCKER LAND

found ecstasy across the wild scene before us. The low red sun almost due north gave a bloody fringe to the hummocks and stained the convulsed pressure ridges. I felt as if I were viewing the frozen snow-buried corpse of some gigantic beast, which in its death throes had twisted in hideous paroxysms of agony, and expired; tracing in its stiffened contortions the spasmed tragedy of its doom.

The two natives could not conceal their hesitation. As we fought our way amid a confusion of bergs, plowing through drifts, and cutting paths across walls of icy wreckage, this hesitation

grew to fear and begat mutiny. Twice Peewahtoq announced his determination to return, pointing out the fact that we were crossing many leads on thin ice which might break up at any minute. But MacMillan increased his promises of rifles and ammunition until they sulkily agreed to stick. Seventy miles out we were still able to see faintly the mountain tops behind us. Regular observations for latitude and longitude checked our dead reckoning. About this time a faint shadow in the northwestern horizon fired us with visions of success. The Eskimos shook their heads. "Puksuaq," they said—"it's just mirage." And so it seemed, for in all the speed of our pursuit, the specter grew no nearer. Peary placed Crocker Land 130 miles out. At 105 miles we cached most of our food and ran for it. Two marches more placed us beyond the 150 mile mark. The day was perfect, crystal clear horizon, and no wind. We climbed the highest berg and saw nothing. Disappointment is a hard lot after real effort. We swallowed ours together with a half ration of pemmican, and returned heavy hearted to our impoverished teams.

With empty sledges we double-marched back to land. Twice were we caught in the jaws of grinding crashing pressure. Several narrow escapes on the rubber ice of leads were scarcely noticed in our swift race to safety. Four hours sleep, 40 miles hike, four biscuit, and a bit of meat, was our program.

We reached the foreshore off the cape with feelings of mixed relief and sadness. Peary's cairn was visible several miles out, and had been our guiding beacon above the low scud of ground drift. We climbed to the summit and secured the record, replacing it by a copy and short account of our expedition to date. And we too, as did our great predecessor, scanned the northern horizon where seamed reflections of ranges of broken ice beckoned in luring falsity. So like land was the phenomenon that, had we not been out, we too should have announced its discovery and urged its exploration.

To our west lay a stretch of coast as yet untrod by man. MacMillan magnanimously gave me this opportunity for real discovery and exploration. All the adventurous blood in my veins boiled up at the prospect. Next morning we separated, he with Etukeshuk towards land in the east, and I with Peewahtoq down the unknown shores in the southwest.

Peewahtoq leading, we advanced rapidly, I sketching and angling as we went. In the first camp he spoke of the scarcity of game, and called my attention to our exhausted teams. From this he turned to abuse of MacMillan and his methods, then to the deceitfulness and weak natures of white men in general. A gust of wind interrupted his silly talk. I went outside and found a storm brewing in the mountains above us. Snow came softly at first, then in a rush, followed by a seething blizzard which drove us to cover.

For two days we half suffocated, making one igloo above the other as the drift buried us. A lull came on the third afternoon. Only one team of six weak and emaciated dogs remained alive. One sledge, clothes, food and most precious of all, fuel lay under 30 feet of wind-packed snow.

We hoped to find better shelter closer inland. My spare footgear was gone, leaving my already blistered feet in bad shape. Peewahtoq drove on with our only stove and a quart of oil. By hard running I caught him.

He sullenly refused to go slowly. I took the rifle from its case and ordered him to follow me. Head down in the wind I did not know he had turned aside until his whip cracked. I cried for him to stop. Without looking around he urged his dogs onward. To make sure I fired into the air. His whip sang again. I pumped in my last cartridge, knelt, and shot for my life.

He toppled drunkenly and rolled into the snow.

(TO BE CONTINUED)

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

SOURCES OF SUPPLY OF NITROGEN COMPOUNDS FOR EXPLOSIVES AND FERTILIZERS

By Rear Admiral Ralph Earle, U. S. Navy

The value of nitrogen in its various forms, both in peace and in war, to the life of a nation cannot be estimated in words, the maintenance of a source of supply that will be uninterrupted being absolutely essential to national existence.

The purpose of this paper is to record in the Proceedings a few notes upon the procuring of this element in chemically combined or "fixed" form, in the hope that they may be of present interest to our service, and, possibly, of value later for reference.

It has been compiled rather than written, the information being taken largely from a paper by Mr. W. S. Landis,[1] one by Dr. Charles L. Parsons, and from statements of Dr. L. H. Baekeland, George W. Patterson, H. C. Porter, Dr. Reese, Dr. A. E. Taylor, Dr. Frank S. Washburn, and Dr. R. B. Earle. These papers and statements have been consulted and used freely, acknowledgment being here made.

The nitrogen compounds are believed to lead the world's trade is tonnage in heavy chemicals, nitrate of soda and sulfate of ammonia having been produced in 1913 to the value of $200,000,000.

The requirements in the explosive industry in the year 1916, in the United States, for one of our largest smokeless powder plants have been 700,950 tons. That it is unwise to depend entirely upon an oversea supply in case our country were involved in a war is amply demonstrated by the difficulty always experienced, due to our deficiency in merchant tonnage, in maintaining such a moderate stock on hand as 120,000 tons.

[1] "The Fixation of Atmospheric Nitrogen," Journal of Industrial and Engineering Chemistry, Vol. 7, No. 5, May, 1915.

Nitrogen compounds are the source of nitric acid, the acid necessary to produce nearly all explosives, both the high and the propellants. To indicate how essential this element is to the explosive industry, it is only necessary to state that, as a close approximation, it requires from 2.8 to 3 pounds of 100 per cent nitric acid (HNO_3) to produce one pound of our powder. To produce a pound of this nitric acid there is required 1.52 plus pounds of soda nitrate ($NaNO_3$). One day's fighting on the Somme consumed about 15,000,000 pounds of powder for artillery alone. This certainly indicates the necessity for a supply of nitrogen compounds. The du Pont Company, since the war began, has supplied in the neighborhood of 500,000,000 pounds of powder to the Allies. To make 200,000,000 pounds, the output of a year, demands 820,000,000 pounds of sodium nitrate.

The use of nitrogen in fertilizers is quite as important as is its use for military purposes. The annual consumption of fertilizers in the United States is divided in this ratio: nitrogen $75,000,000, phosphoric acid $65,000,000, potash $35,000,000. Potash, roughly speaking, comprises 20 per cent of the fertilizer.

Germany agreed, in 1915, to sell nitrogen to agricultural interests for fertilizers at half the price then paid in the United States by farmers, although she had no water power and had to use fuel in its fixation.

For the insurance of a nation's food supply, potash and phosphates are quite as necessary as are nitrogen compounds.

The only real source of supply of potash, at the outbreak of the European War, was the Stassfurt deposits in Germany. Potash from these deposits, prior to the war, sold for $35 a ton, but immediately after the war began, the sellers of this material bought it back, as far as they were able to do so, from the original purchasers, paying therefor from $300 to $450 a ton.

In the ocean there are tons of potassium sulphate (K_2SO_4). The "salt gardens" on the coast of France had lost their industrial importance when these Stassfurt deposits began to be worked. The United States has solved the problem of the supply of potash, at least for the present, by utilizing the sea kelp which is obtained in sufficient quantities off San Diego, California, to supply the agricultural needs of the country for many years.

Three private concerns are gathering this kelp from the Pacific, and treating it commercially, one for the acetone—to be used in

nitro-glycerine powders—two for the potash. At Summerland, in Santa Barbara County, California, there is a government experimental plant under construction, a plant equipped with a seagoing mowing machine barge of a capacity of 100 tons of wet kelp. The kelp grows in water that is up to one hundred feet in depth, rises to the surface and there extends for many hundred feet. This supply seems inexhaustible, for it grows so quickly that four harvests can be made a year. The yield per one hundred tons of wet kelp is ten of dry, which gives 2.5 tons of potassium chloride. The dried kelp is distilled in retorts, resulting in a charred residue that contains all the potash salts, which are then recovered by leaching and evaporation. During the distillation, the nitrogen in the kelp is driven off in the form of ammonia. Combustible gas, and iodine are comprised among the other by-products, thus rendering the distillation of sea kelp a practical commercial enterprise.

In April, 1917, as another source of this potash, there was completed in the Searles Lake region of California, a plant for the production of the 80 per cent grade of muriate of potash, at a rate of 1000 tons per month. It is probable that this region will be worked by the government to full capacity, for the potash obtained from this source alone will make the country independent of foreign supplies forever.

As also a possibility, it is worthy of note that the dust that accumulates from processes in the manufacture of pig iron from iron ores contains appreciable quantities of potash (K_2O), in some cases as high as 9.9 per cent.

Phosphate rock, and phosphorite are of much economic value for conversion into the "super-phosphates" largely used as a fertilizing agent. These are more or less impure normal calcium phosphates [$Ca_3(PO_4)_2$].

To insure a quick distribution of phosphates in soils, and a more concentrated solution of phosphoric acid about the roots of plants, it is necessary to use a more soluble phosphate than are these calcium phosphates. The chemical reaction used is to treat hydrogen with chamber sulphuric acid, and then this

$$Ca_3(PO_4)_2 + 2H_2SO_4 = CaH_4(PO_4)_2 + 2CaSO_4$$

occurs, the right hand quantity being mono-calcium phosphate, calcium sulphate and a little undecomposed normal phosphate known as the "super phosphates," which is much valued as a fertilizer.

In 1908, Florida produced 1,673,651 tons of phosphate, more than all the other states put together, Tennessee ranking next in production, then the Carolinas, Alabama, and Pennsylvania.

The cheapest source of the world's supply of nitrogen required in the explosive and fertilizer industries is the soda nitrate ($NaNO_3$) found in depths of from one to five yards in the Atacama and Tarapaca provinces of Chile. The exports for years ending June 30, Chilean nitrate industry are:[2]

1911-1912	54,254,471	Spanish quintals[3]	
1912-1913	58,492,375	"	"
1913-1914	58,751,291	"	"
1914-1915	32,070,714	"	"
1915-1916	55,285,814	"	"

Imports of sodium nitrate (from Chile) into the United States, for consumption were:

Calendar years	Short tons
1912	545,192
1913	686,404
1914	611,218
1915	863,103
1916	1,365,963

The cost of this Chile saltpeter varies from $47 to $54 per ton to our government, but as high as $80 to $85 to smaller consumers, and yields in nitric acid according to this formula, using approximate whole numbers for atomic weights:

$$NaNO_3 + H_2SO_4 = HNO_3 + NaHSO_4$$

23	2	1	23
14	32	14	1
48	64	48	32
			64
85	98	63	120

Theoretically; 100 lbs. nitrate give 74.11 lbs. nitric acid.

Practically, however, the yield obtained is much less, to wit:

100 lbs. sodium nitrate gives 66.9 lbs. of 100 per cent nitric acid (this with 96 per cent sodium nitrate and 94 per cent recovery).

From the last fiscal year report at the naval smokeless powder factory, one pound of powder required 2.239221 lbs. sodium

[2] Commerce Report, August 29, 1916.

[3] One Spanish quintal equals 101.4 lbs.

nitrate, in this manner; 1 lb. powder required 1.498 lbs. 100 per cent nitric acid, and 1.495 lbs. sodium nitrate was required to 1 lb. 100 per cent nitric.

The last fiscal year report of the naval smokeless powder factory also shows that one pound of powder required 3.1252 lbs. fortified acid, which carries approximately 48 per cent of nitric acid.

Considerably better figures this year may be expected, however, as the plants continue to operate and to increase in economy and efficiency.

In time of peace, it thus costs our government from $81.40 to $82.08 to produce a ton of nitric acid in this country (calculated as HNO_3 100 per cent).

In January, 1915, Germany had on hand 750,000 tons of Chile saltpeter, a large figure compared with the total usual stock maintained in our country of about 250,000 tons. By the capture of Antwerp, about 200,000 tons more were obtained.

This particular source of supply of nitrogen can be relied upon during the war only for the country whose navy maintains command of the sea, and thus chemical processes have been developed to render countries self-sustaining in their supply of "fixed" nitrogen. These processes are known as the fixation of atmospheric nitrogen. This nitrogen fixation industry started in the year 1898, the first commercial plant in the world being erected in Italy, in 1904. The industry, however, did not become practical until the year 1910.

Nitrogen being obtained in the "fixed" form, that is chemically combined with other elements such as hydrogen in ammonia, or with metals or carbides as in the well-known cyanamide, the next step in the utilization of this inert and inactive gas for explosives is the production of nitric acid. To obtain this nitric acid requires oxidation plants that are complex mechanical chemical problems, and are extremely difficult to operate successfully. When the ammonia from by-product coke ovens is used as a source of nitric acid, an additional chemical process, known as the purification process, becomes necessary. The plants for such a process are fairly well standardized, and do not present the large up-keep costs of the oxidation plants.

In successful use, commercially, at present, there are four processes for the fixation of nitrogen; three air processes and the by-product coke process. In addition thereto, two others, that may

in the future be worthy of careful consideration, are under experimentation. These latter are called the Bucher process and the Zerpec process.

The air processes are usually classified into three groups known as:

(a) Direct synthesis of ammonia from nitrogen and hydrogen.
(b) Combustion of nitrogen and oxygen in the electric arc, and
(c) Combination of nitrogen with metal or carbides.

These processes will be described briefly, it not being possible to delve deeply into the details, owing to the small amount of knowledge available to one outside the inner circles of the industry, and because, being still experimental and not fully developed to the degree of practicability eventually expected, these details are subject to constant change by those employing them commercially.

The Haber process is the best known of the first group, and is therefore considered first.

HABER PROCESS

SYNTHESIS OF AMMONIA FROM NITROGEN AND HYDROGEN

About five years before the opening of the war, certain German chemical firms, in particular the Baden concern, became interested in the Haber process for the production of ammonia. When they became convinced of the technical and financial possibilities of this method, they lost interest in the electric arc or Norwegian venture, and by 1914 had sold their holdings therein largely, if not entirely. In all probability, this decision was influenced by considerations of desirability of independence from import, though founded in large part upon purely financial considerations.

In Antwerp, before the war, a German company was operating a plant for making nitric acid by the oxidation of ammonia according to the Ostwald method. This plant was in operation when Antwerp was attacked, and one of the first shots of the Germans hit and wrecked the plant.

Germany is now producing, within her own borders, a very large amount of nitric acid with the Haber process. In 1917, the amount of ammonia which will be produced by the Haber process will amount to 500,000 metric tons, equal to 412,000 tons of nitrogen. Electrical generating plants have been erected directly beside the brown coal deposits where the coal is mechanically quarried,

handled by an endless chain, and delivered to the boilers by mechanical stokers. It is known that the amounts of nitric acid thus being produced are large and that the price is low. How large the production and how cheap the price, as compared to the price of nitric acid produced by electrical energy in Norway, is not known. Technical chemists, however, have already ventured the prediction that further development in this direction will result in the production of nitric acid and nitrate at such low cost as to make Germany after the war independent both of the Chile saltpeter and the nitric acid electrically produced in Norway and Switzerland. In a recent technical publication in Austria, it was stated that the manufacturing chemists of Austria who desired to develop the hydro-electric possibilities of the Austrian waterfalls, had petitioned the government to undertake the establishment of a nitrogen monopoly which, with the assistance of a high tariff, would later protect them in Austria from competition with the coal produced nitric acid of Germany. During the 1914-1915 session of the German Reichstag, a bill was introduced proposing the establishment of a state monopoly for nitrogen. This bill, which was opposed by the manufacturers of chemicals, was not passed. Recently it has been announced that a consolidation is underway that will bring into one huge organization practically every manufacturer of chemicals in Germany.

Briefly the original Haber process consisted in passing a mixture of three volumes of hydrogen and one volume of nitrogen at a pressure of upwards of 150 atmospheres over a suitable catalyzer that required a temperature of some 500 to 700° C., in order to cause the hydrogen and nitrogen to unite and form ammonia.

$$N_2 + 3H_2 = 2NH_3$$

A single passage of this mixture through the apparatus causes a transformation of from 2 to 6 per cent of the nitrogen to ammonia, this product being then recovered from the apparatus by condensation, and the remaining and much the larger portion of the gases uncombined returning to the cycle.

The advantages of the Haber process are: the low power consumption; the possibility of working in small plants widely separated (600 to 2000 tons ammonia units).

The early disadvantages, which as will be noted later have been mostly overcome, are: the difficult engineering problems involved in the use of 150 atmospheres pressure and temperatures from

500° to 600° C.; the difficulty of obtaining metal containers or apparatus that will hold hydrogen gas under these temperatures and pressures; the high repair and renewal costs (in Germany these are reported to have been as high yearly as one-third of the total cost of the plant, this on 60-70 cent labor); and the necessity of liquefying not only air to produce nitrogen, but also "oil, water gas" to produce pure hydrogen; oxygen, hydrocarbons and sulphur being fatal to the catalyzer.

Briefly then, this process is not supposed to involve the use of any considerable quantity of electric power, but does require a large amount of highly skilled labor as the units are small and complicated. This particularly suits it to the Rhine. At Oppan, the Badische must dispose of large quantities of waste sulfuric acid and have at their disposal by-product hydrogen; hence local conditions favor this process above all others. This excess supply of sulfuric acid has led to the installation of an absorption process whereby the nitrous gases are absorbed by soda lye and transformed to nitrate of soda, from which nitric acid is made in the usual manner by means of sulfuric acid. Germany apparently has a monthly production of 30,000 tons of sodium nitrate.

The latest information indicates that the Germans are now using the Haber process or a modification thereof successfully, but comparisons of costs are not available. In this country it is understood that the General Chemical Company, after investigations, declined to purchase Haber patents. It is rumored, however, that they have been experimenting during the last two years with new catalyzers, using a modified Haber process.

It is to the development of the ammonia processes, the Haber process being one, that Germany owes largely its present independence of imported supply of nitrogen. The German chemical concern which acquired the Haber patent had, even prior to the war, not only become convinced of its great applicability, but had, indeed, made extensive improvements in the technique. In the original Haber process—which represented a very distinguished discovery in technical chemistry—as has been shown, gaseous nitrogen and hydrogen, prepared by electrolysis from water, were subjected to very high compression and heated to a high temperature, when, in the presence of osmium or uranium, the gases associated to form ammonia.

Since the beginning of the war, further improvements have resulted in such marked advances in efficiency as to have made this process one of most far-reaching importance for all time. A high temperature is not now required; this is furnished by heat from coal, and is understood to be not in excess of 500° C. High compression is no longer required; this is understood to be not in excess of two or three atmospheres. Expensive metals like osmium and uranium, originally employed as catalytic agents, have been replaced by iron, now used in the form of iron filings so spun as to constitute a veritable iron wool. The nitrogen is obtained from the air after removal of the oxygen. The hydrogen is obtained by purification from coal gas. With this method very large amounts of ammonia are now being produced. Unofficial, though presumably reliable, information has been furnished to the effect that the present cost of production of ammonia by this process is about one-third that of the cost of production of ammonia by any method prior to the war. It is possible that after the war it will no longer pay, in competition with this method, to recover ammonia from the gases from distillation of coal. From the ammonia thus obtained, nitric acid may be indirectly produced.

The yield of nitric acid from this ammonia is very high, representing 90 to 95 per cent of that theoretically expected. The oxidation plant required represents a large outlay of chemical engineering skill. After the ammonia is at hand the cost in England in 1915 of making therefrom one ton of nitric acid was $27.

Arc Process

Combustion of Nitrogen and Oxygen in the Electric Arc

The formation of oxides of nitrogen in the electric arc from the oxygen and nitrogen of the atmosphere is really only a thermochemical reaction, the arc flame yielding the very high temperature at which association occurs to a notable degree. The availability of the process is directly dependent upon the commercial cost of electrical energy.

The first large plants for the fixation of nitrogen by this electrical arc method were established in Norway. The major part of product of these plants was lime nitrate for fertilizers, and nitric acid, as such, was a by-product only.

In this electrical arc method, a current of atmosphere is drawn through the arc flame, and the air after passing the heated zone is drawn either into water or into a solution of hydroxide of lime. Thus, the final yield is either dilute nitric acid or calcium nitrate, with a certain admixture of nitrous acid and nitrite. This calcium nitrate—known as Norwegian saltpeter in contradistinction to Chile saltpeter which is sodium nitrate—has been employed to some extent as a fertilizer, though more largely used to yield nitric acid for technical purposes.

In a temperature of 5432° F., one molecule of oxygen ignites with one of nitrogen, and together form two molecules of nitric oxide, this being the first step in the process. From the electric furnace, the nitric oxide passes at a temperature of 1382° F. into that part of the apparatus where, at a temperature of 1148° F., it unites readily with free oxygen and forms nitrogen peroxide, a brown gas.

Chemical reaction as follows:

$$(a)\ N_2+O_2=2NO$$
$$2\times 14+2\times 16=2\times 30$$

$$(b)\ 2NO+O_2=N_2O_4$$
$$2\times 30+2\times 16=92$$

Only about two per cent of the gases leaving the furnace are N_2O_4, the balance being unchanged oxygen and nitrogen.

Next, the nitrogen peroxide is drawn from the oxidation chambers into absorption towers. These towers are filled with fragments of quartz and have at the top a spraying arrangement similar to falling rain. The gas enters each tower from the bottom and is passed through three towers before the cycle is completed. The falling spray ranges from fresh water to more or less dilute nitric acid, depending upon the tower, and, as it trickles downward over the quartz, it offers a large surface of liquid for the absorption of the nitric vapors from the ascending gas. By repeating these processes the nitric acid is gradually concentrated until it has a strength of 50 per cent. If a greater per cent is required this can be obtained by concentration through the application of heat.

Most of these nitric acid plants, therefore, either concentrate the acid to 96 per cent strength by special means, or convert it into calcium nitrate for fertilizer use, or into ammonium nitrate for explosive purposes. It is quite probable that calcium nitrate will

soon disappear from the fertilizer market, as it apparently cannot be sold at a profit in competition with Chilean nitrate or ammonium sulfate.

Per ton of nitric acid this arc process requires from 2.9 to 3 horsepower year.

The advantages of the arc process appear to comprise the small number of steps involved; and the low cost when power is very low in cost, such as is the rule in Norway, provided plant is run continuously to capacity.

The disadvantages of the arc process are; greater dilution of nitric acid first produced; large horsepower requirements—these are so great as to make the cost of the manufacture of acid by this method, in our country, absolutely prohibitive—probable small market for the product in time of peace because of the fact that it is the acid alone, so that two-thirds of plant will probably be idle in time of peace and there will be a consequently large idle investment involved; a large original investment is necessary; the non-transportability of product is a problem; and the hydroscopicity of calcium nitrate produced makes it almost certain that this sole possible fertilizer product would not be found applicable to our farm conditions.

The most available and best known sources of power supply by water, in this country, apparently are now Priest Rapids on the Columbia River, and the 30-mile stretch of Muscle Shoals on the Tennessee River, in northern Alabama. This latter source has valuable phosphate deposits, so necessary to fertilizers, close at hand. Our engineers have figured $120 per horsepower cost installation at Muscle Shoals. The Norwegian cost was $37 per horsepower used for generators, furnaces, absorbers and other nitric acid equipment. The theoretical figures for horsepower requirements per ton nitric acid run from 2.1 horsepower year to 2.79 horsepower year.

The arc process plant of the Southern Electrochemical Company at Nitrolee, S. C., now reported to be making four tons a day experimentally, will not be increased according to latest reports. The plant uses 3000 kw., the Pauling process, and expects to put acid on the market cheaper than is that made from sodium nitrate. This plant bought in considerable quantities of $CaCO_3$ (marble) with the idea of making calcium nitrate as fertilizer. This plan was abandoned, the marble being used as railroad ballast.

The arc processes in actual operation are three, all of which give as a product a gaseous mixture containing from one to two per cent by volume of nitric oxide, from which nearly 95 per cent in the form of 30 per cent to 35 per cent nitric acid is recovered. To further concentrate, ammonia obtained from cyanamide is largely used. The temperature of the flames and escaping gases respectively is: in the Birkeland-Eyde, 3500 and 800-1000° C.; in the Schönherr, 3000 and 1200° C.; and in the Pauling, — and 1000° C.

The enormous quantity of cheap power required in these processes restricts its use practically to Norway, where at Rjukanfos and Notodden a total of 350,000 horsepower (250,000 kw.) is being utilized.

It is thus clear that the Haber process for the direct production of ammonia and the arc process for the production of nitric acid through electrical energy obtained from coal, complement each other in a most unusual fashion, with the result of insuring to Germany practically unlimited supplies for technical use in time of war. These processes promise also for the future not only to make Germany independent of all importation of nitric acid and nitrate, but also to make her a competitor in the markets of the world against all sources of nitric acid and nitrate, however produced or derived in nature. In a certain sense this would result in a material destruction of German capital, since German capital is largely interested in the Chilean saltpeter deposits.

BUCHER PROCESS

In addition to the modified Haber process, now being experimented with by the General Chemical Company, there are two other processes, one of which may shortly be worthy of very careful practical consideration.

The Bucher process is now being exploited by Arnold, Hoffman & Company, or the Mathison Alkali Company, at Saltville, Va. It is a process for the production of sodium cyanide. Its essentials consist of the heating of a mixture of two parts of coke, two of iron, and one of sodium carbonate, to a temperature of 800° to 900° C., and the passing of nitrogen through the mass. Under these conditions, sodium cyanide is formed. If steam is blown through the mass, sodium ferro-cyanide is formed. Up to the present time, the sole output has been sodium ferro-cyanide, which

they are now producing in small quantity under the conditions mentioned. As high as 18 per cent of nitrogen has been fixed in the form of cyanide. In certain experiments they secured as high as 30 per cent nitrogen fixation by increasing the amount of sodium carbonate present. As far as chemical problems are concerned, the details of the process are solved, there being no difficulty under these conditions. There are, however, very grave mechanical difficulties, which any chemical engineer will recognize at once in the heating of a mixture of this character to the temperature given. At present, the only furnace suitable to use consists of iron tubes, and these tubes go to pieces in ten days to two weeks and have to be replaced. Apparently no material is known which will withstand the furnace conditions. A corps of engineers is working on the problem from a mechanical standpoint, in the hope that a furnace may be devised, but there is no immediate prospect of a solution. However, if these mechanical problems should be solved, there appears to be great hope for the process.

ZERPEK PROCESS

The Zerpek process absorbs nitrogen in the form of aluminum nitride. This process has been experimented with for years in Europe, unsuccessfully, no commercial plant being in operation. Reports are to the effect that the process has been abandoned abroad. On the other hand, the process is being experimented with in this country by the Aluminum Company of America; although it is understood that they are as yet far from a commercial solution. At the moment the process does not appear to be developed as a practical success.

THE CYANAMIDE PROCESS

This is the best known of the processes involving the combination of nitrogen with metals or carbides. In 1914, there were some 14 factories in operation which produced 300,000 tons of cyanamide that contained about 20 per cent nitrogen.

The largest cyanamide plant, the Canadian factory of the American Cyanamide Company, in this country, is located at Niagara and produces 110,000 pounds of ammonia each 24 hours.

The inventors of the cyanamide process originally attempted the synthesis of cyanides by subjecting barium carbide to the action of nitrogen, which forms barium cyanide. On attempting

to use the cheaper calcium carbide in place of barium carbide, Professors Frank and Caro found that instead of obtaining a cyanide, they obtained a new material, which proved to be calcium cyanamide. It was found later that this material could be utilized directly in agriculture, and from this discovery has grown the cyanamide industry, which has proven to be a practicable method of fixing atmospheric nitrogen.

The ammonia produced abroad by the cyanamide process is at present being converted into a high-grade sulfate, and a pure nitrate, while in this country a new fertilizer material, consisting largely of ammonium phosphate is being manufactured. This product contains over 13 per cent NH_3, and 45-50 per cent P_2O_5, or over 60 per cent plant food, the bulk of the remainder being chemically combined water, and when mixed with the high-grade potash salts available, will make a complete fertilizer some six times as concentrated as the average grade sold to-day.

The cyanamide process involves the production of calcium carbide. To produce day after day a high-grade calcium carbide that meets the peculiar requirements of the cyanamide industry is difficult. There are two independent initial steps; the first is the making of liquid air. The atmosphere is composed of two gases which are not chemically combined. They are chemically separate, and when cooled to about 190° below zero C., the two gases become liquid. If the temperature is allowed to rise, the more volatile liquid, nitrogen, evaporates first, and is carried away, while oxygen gas is obtained by evaporating the residual liquid.

In the early days of the cyanamide process, when the Niagara plant started, liquid air machinery was in a rather backward state of development, and nitrogen was made by passing air over copper. After the development of the liquid air machinery, both in the way of capacity and reliability, the problem of producing pure nitrogen was much simplified, and the latest plant at Niagara includes what is probably the largest liquid air plant.

Coincidently, there has been prepared in electric furnaces—those used run about 3500 horsepower each—a peculiar form of carbide. Subjected to the very high temperature of the electric furnace, coke and lime melt into a liquid. This is tapped very much as an iron furnace charge is run off, and the product is known as calcium carbide. It is ground to such fineness that it passes a hundred mesh screen. This must be done without slaking the

carbide, as hydrated lime does not make good cyanamide. One hundred mesh carbide dust, when exposed to the atmosphere on a damp day, or thrown out on damp ground, is almost as explosive as low-grade dynamite, hence it is quite a problem to grind such carbide to the required degree of fineness without accident.

After the difficulties in the production of a proper grade of nitrogen and of carbide have been overcome, these two are exposed to mutual reaction at a proper temperature, which is done in small individual secondary electric furnaces or ovens, under pressure, holding from one-half to two and one-half tons of carbide. The reaction itself is reversible, and particular precautions must be taken to keep it always running in the right direction until the carbide has all been nitrified. The product removed from these ovens is a black, hard cake, which analyzes 22 per cent nitrogen and about one per cent un-nitrified carbide. This material, called lime nitrogen, is finely ground and stored in silos. The carbon set free in the reaction previously indicated is in the form of graphite, and it is not simple to obtain a satisfactory mill that will grind this material finely, and at the same time not blow itself up from liberated acetylene derived from the presence of any uncombined carbide, or wear itself out grinding the lime nitrogen-graphite mixture. Extreme precautions are taken in this operation, both in the mills themselves and in the elevating and conveying apparatus connected with them, to avoid dangerous explosions.

There are 480 of these secondary electric furnaces in the Canadian factory, at Niagara. Under the temperature of the electric resistance in that furnace, the nitrogen combines with the carbide into a chemical compound known as calcium cyanamide, composed of calcium, carbon, and nitrogen. The cyanamide, by treatment with steam under great pressure, gives ammonia gas. This gas is carried through a so-called contact process by passing it over a very fine mesh of platinum to come out as a weak nitric acid.

$$CaC_2 + N_2 = CaCN_2 + C$$

Ca = 40
C = 12
N = 14

It is a very simple matter to convert cyanamide into ammonia by the exothermic reaction:

$$CaCN_2 + 3H_2O = 2NH_3 + CaCO_3$$

Ca = 40
N = 14
H = 1
O = 16

If this lime nitrogen is mixed in a slurry with water, and subjected to the action of heat and high pressure, it is converted quantitatively into ammonia.

It is also possible to transform cyanamide into urea.

In 1916, 400,000 tons of ammonia, and 80,000 tons nitric acid was produced by this process in Germany.

Purification apparatus for taking out the impurities in the nitrogen as it comes from the copper retorts is necessary. This plant includes soda towers for removal of carbon dioxide, refrigerating plants for drying, lime tanks for purification, as well as a causticizing plant for recovery of spent alkali.

Calcium cyanamide, when subjected, particularly at temperatures above normal, to the action of water, tends to transform itself into a large number of organic compounds, and, therefore, this hydration has proven an extremely complex problem.

When a special grade of cyanamide is melted down with a flux, such as common salt, it combines the free carbon present with the cyanamide radicle, forming cyanide; this crude form of cyanide dissolves very readily in water and filters rapidly from the insoluble, after which the solution is ready for metal extraction, or other uses to which cyanamide in its dissolved form can be put. Large scale experiments have been tried out in a number of the big cyanamide plants scattered at various places throughout the world, and in every respect this material has shown an exactly equivalent value to the higher grade cyanides. The transformation of the cyanamide nitrogen into cyanide nitrogen is almost quantitative.

The advantages of this process are: the reasonable horsepower requirements—Dr. Landis states that in the production of nitric acid by means of cyanamide, about 90 per cent of the power is used for the making of cyanamide, and about 5 to 10 per cent for the transformation of the ammonia into nitric acid, and that for producing one ton of 100 per cent nitric acid, per year, it requires 52/100 to 55/100 of horsepower, or, roughly speaking, half a horsepower per ton of acid per year—it is probably the cheapest

source of pure ammonia known, as evidenced by the fact that the du Pont Company is using cyanamide transported from Niagara to New Jersey as the source of the immense amounts of ammonia used by them for the production of ammonium nitrate; product is easily transported to any place for fertilizer, or to manufacture ammonia or nitric acid; product is salable in times of peace for fertilizer, thus carrying the plant investment; comparatively high concentration of nitric acid first produced; production in regular course of operation of ammonia, which is itself of value for the preparation of such war necessities as ammonium nitrate, and for peace requirements of a concentrated fertilizer as ammonium phosphate. It is also used in quantity for refrigeration purposes. The peace requirements for ammonium phosphate would also mean building and enlarging of the sulphuric acid industry—itself highly important in time of war.

The greatest progress in Germany is shown in the Haber, the extent and increase of the cyanamide industry being largely due to the fact that it was subsidized by the German Government to the extent of $38,000,000, and started in the early days of the war, while the Haber process competed simply by means of the push of the Badische Company. In the arguments before the Reichstag for a nitrogen monopoly and the fixing of a nitrogen price, the monopoly was requested by the cyanamide people and every effort made to put it through, in order to establish their industry after the war. The monopoly was successfully fought and defeated by the Badische people on the basis that the Haber process could compete with Chile saltpeter or any synthetic process in the open market, without subsidy or price fixing of any kind. It is the fact that it is with the Haber process that progress is now being made in Germany.

The following is taken from a report of the Badische Company to the Reichstag Committee charged with the preparation of the discussion on the monopoly:

> We have at our disposition, in our own territory, all the raw materials necessary for our manufacture; consequently, our expansion is unlimited and from now on we shall be entirely independent of foreign countries. Our only practical limit is the consuming capacity of the world market. That is why we are opposed to any kind of monopoly; we do not need any protection, as we are sure to fight successfully against any competitor.
>
> The coke ovens and the gas works are likewise against monopoly. They have to eliminate the ammonia from the gas; hence it will always be to

their interest to recover this ammonia from the gas; even when the price of nitrogen fertilizers will drop sufficiently so as to shut out entirely from the market the Chile nitrate. This ammonia, as well as ours, will be available for agriculturists, no matter whether there exists a monopoly or not. This monopoly can only serve to render possible the production of large quantities of the fertilizer for which the agriculturists show the least sympathy, that is, cyanamide . . . .

Either the monopoly will guarantee the profit of the cyanamide industry; in that case the German agriculturists will pay higher prices than the tariff (for if we have the same prices we do not need a monopoly); or, the monopoly will bring its prices in agreement with the prices of foreign countries; in that case the object of the monopoly to make the cyanamide industry viable would be an illusion. That is why we shall never rise up with too much vigor against the monopoly.

One of the great difficulties in the development of the cyanamide process was to determine beforehand what kind of a nitrogenous product the soil bacteria or plant bacteria would accept as a diet, and to determine whether or not the cyanamide would be taken hold of by nitrifying bacteria and used in forwarding the growth and structure of the plant. Thus it was a bacteriological problem as well as a chemical problem.

For fertilizer, in order to be safe, cyanamide can only be used in small quantities, it being necessary to use an ammonium phosphate. Germany has determined that calcium nitrate and cyanamide must not be used together in fertilizers.

To prepare the lime nitrogen for agricultural purposes, the finely ground material is partly hydrated to insure decomposition of the carbide it contains, is then oiled to render it dustless, and either stored in bulk, or packed immediately into sacks and shipped to the fertilizer mixer.

The ammonia produced abroad by the cyanamide process is at present being converted into a high grade sulfate and a pure nitrate, while in our country a new fertilizer material, consisting largely of ammonium phosphate is being manufactured. This product contains over 13 per cent NH_3, 45-50 per cent P_2O_5, thus having over 60 per cent plant food, the bulk of the remainder being chemically combined water. This composition mixed with the high-grade potash salts available makes a complete fertilizer some six times as concentrated as the average grade sold to-day.

BY-PRODUCT AMMONIA PROCESS

The ammonia recovered in the manufacture of coke, coal gas, and in other chemical processes involving the distillation of coal, is really a by-product; and in all probability it would not pay to enlarge or modify the main processes in order to increase the amount of ammonia that could be obtained from this source. The need of nitrogen created by the war has probably not been met, to any material degree, by increase in ammonia obtained from this source.

Coke making, said to be spoken of first by the Greek philosopher, Theophrastus, born 372 B. C., was also understood by the Chinese in the arts thousands of years ago, but was not of any real value until the nineteenth century. From 1880 to 1890 the first by-product recovery ovens were built on a commercial basis in Europe, but it was not until about 1894 that 40 ovens were built here. During the first 10 years they were not oversuccessful, for they were built after German design and had not been adapted to conditions here, but to-day, according to engineers, they surpass in every way the ovens now being built in Europe. "In coking coal," the results obtained are coke, ammonia, tar, and gas. These, for many years, were the only products that the average American coke producer bothered about. The Semet-Solvey Company of Syracuse has for many years been recovering the benzol and its homologues, but until the war broke out in Europe, this feature of recovery was generally neglected. For every ton of coal coked in by-product ovens in the United States, an average of 23 pounds of sulfate of ammonia of 25 per cent NH_3 value, or its equivalent, is recovered. The NH_3 is the ammonia content of the sulfate of ammonia which contains 25 per cent of ammonia. The sulfate is practically all marketed on a commission basis, by one firm of brokers in the United States. It amounted before the war to 115,000 tons in 1910, and in 1914 to 190,000 tons, but, with the impetus given to by-product oven building, 1917 will see nearly 400,000 tons of sulfate produced. Examine the present yields of by-products from a ton of coal, and how the sulfate compares with the others will be shown. One ton of coal yields about 70 per cent of coke, and it costs from 60 to 70 cents a ton to convert it into coke. One ton of coal yields as follows:

6000 cu. ft. surplus gas of 550 B. T. U., value for fuel or illuminating, say 8 cents M cu. ft.	$0.48
20 lbs. sulfate of ammonia, which has sold for some time past at 3 cents per lb.	.60
7 gallons tar, worth 3 cent per gallon	.21
2½ gal. benzol, worth 15 cents per gal.	.375
3 gal. toluol, worth 15 cents per gal.	.45
	$2.115

The advantages of this process are, first: immediate availability —there being almost enough ammonium sulfate now produced in the country, if diverted to this use, to meet government war time requirements; second, concomitant production of benzol and toluol.

Its disadvantages are the higher price of ammonia and accordingly nitric acid, even under ordinary conditions.

The Barrett Company of New York stated their annual production at both coke and gas plants was 325,000 tons of ammonium sulfate. In 1917, the combined capacity of the country should be 580,000 tons of nitrogen. Germany at the outbreak of the war had but 120,000 tons.

In the United States, in the year 1915, there were 6268 by-product ovens built with 1191 building. Pennsylvania has over twice as many of these ovens as has her nearest competitor, Indiana. The coke produced in that year was 41,581,150 tons, valued at $2.54 per ton, showing a large increase in the industry, which, in 1880, amounted to but 3,338,300 tons at a value of $1.99 per ton. The market price of coke has increased remarkably since the fall of 1916, until in April, 1917, it is quoted at $9.00 per ton.

The economic value of this coke process can be realized when it is considered that coal as a power producer is much more efficiently used when it is first converted into gas, and this gas used in gas engines, effecting a great saving over the steam engine—a practice which if followed would make available the ammonia and other by-products of the coal that are now used for power production.

* * *

From the foregoing review it is evident that the nation has at hand a source of fixed nitrogen adequate for normal times, and one capable of immense and immediate expansion in time of emergency.

Congress, in an act dated June 3, 1916, provided $20,000,000 for the establishment of a nitrate plant. To assist in making this

choice, a committee designated the "Nitrate Supply Committee" was appointed by the Secretary of War. It comprised as its members many scientists and engineers of note, together with the chiefs of the ordnance bureaus of the War and Navy Departments. This committee met in May, 1917, and made its decision as to what it considered to be the best process for adoption and also the general locality in which the government plant for the fixation of nitrogen should be located.

From the descriptions of the various processes, one draws the conclusion that no method for the fixation of nitrogen is sufficiently well standardized, by use and actual results, to enable the best method to be chosen without a possible chance of error.

The process being chosen for fixation, there yet remains to be determined the one of oxidation of the nitrogen into nitric acid for use in explosives, and also the determination of the best form in which to supply it for agricultural purposes. The oxidation methods are not simple, and there is no real agreement among chemists as to the best manufacturing way. To produce on large scale, the minutest details must be certain and fixed, otherwise there will result great losses in material and time. The oxidation methods must of course provide for the oxidation of the ammonia received from all sources including both the fixation plants and the coke ovens, requirements that must be met in order to utilize the large amounts of ammonia available in the country, and which also entail the adoption of purification methods not easy of determination.

The best known process for the oxidation of ammonia is the Ostwald process, in which the reaction

$$NH_3 + 4O = HNO_3 + H_2O$$

is brought about by passing the mixture of gases over spongy platinum, platinum, or platinum black as a catalyzer, at temperatures of about 300° C., and at a velocity of two meters per second. The time of contact between gas and catalyzer should not exceed 1/100 of a second, or decomposition of the product into nitrogen and water will very seriously cut down the yield, which under properly adjusted conditions is close to the theoretical.

Thus the problem of supplying nitrogen to our country is a large one, and one well worthy of such capable talent as will be devoted to it by the War and Interior Departments, to the personnel of

which our army, navy, and marine corps, in time of stress when Chilean nitrates become unprocurable, look with well placed confidence for the successful solution that must be reached in order that we may supply the nation's armed forces, ashore and afloat, both with explosives and with food.

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THE SITUATION AND ORGANIZATION

By MAJOR G. C. THORPE, U. S. M. C.

The "estimate of the situation" is a process of reasoning whereby a decision is reached as to the answer to the question, "How shall the thing be done?" It is as applicable to tactics as to strategy; as applicable to policy or logistics as to tactics. Indeed, it is a necessity to the individual, whatever his vocation, for no man or woman lives who is not constantly confronted with the problem of selecting courses of action.

Being a process of reasoning, the estimate may be stated in form. The first premise must be an answer to the question, "What is required?" or "What is to be accomplished?" or "What is the mission?"

Every activity is an answer to an obstacle. All nature is a wonderful array of opposing forces. A situation is a temporary state or relation of conflicting elements at a moment of action. Therefore, to judge of the situation, we must compare the forces, or elements, that are in opposition. The estimator first considers what must be overcome, then the resources at his disposal for the task.

The formidableness of an opposition depends not only upon its size but upon its quality and position. A powerful force, far removed, may not be so serious a threat as a much smaller one nearer at hand; as to quality, we may say that a slowly moving body has not the momentum of an equal mass with a higher velocity.

Our comparison of forces, then, must be elaborated, step by step, as we estimate the two; this elaboration gives us details of a minor premise for our reasoning. The greatest care must therefore be taken to see that the data employed in these comparisons be correct.

The form of the estimate thus deduced appears to be:

I. Mission.

II. Comparison for Forces:
  (a) Opposition:
    1. Strength.
    2. Location or Position.
    3. Quality.
    4. Possible courses it will adopt.
  (b) Our Own Force:
    1. Strength.
    2. Location or Position.
    3. Quality.
    4. Courses that may be adopted to defeat opponent's possible courses.

III. Conclusion: Of our own courses select the one which best answers the course the opponent will probably pursue.

This form may well be applied generally to all forms of estimating a situation, variations being introduced to suit the characteristics or nature of the subject matter. It might, for example, be applied to determine whether or not one should undertake a certain business enterprise. The mission might be: "To obtain a majority of the stock of the M. and N. Railway Company." Comparison of the forces would be a comparison of the obstacles with the facilities or resources for overcoming them, etc.

In the following pages we shall direct attention to four kinds of estimates: (1) political, (2) strategical, (3) tactical, and (4) logistical.

The first is the statesman's survey of international relations, the object of his quest being to ascertain whether or not there exists, or may soon arise, effective opposition to his own country's policies, and, if so, what should be done in the way of either modifying our policies or preparing to support them with adequate force by alliances or increase of military power.

The second, the strategic estimate, is in operation when it seems probable that force will be required, or when war is already in progress; it compares national fighting forces from a military point of view.

The tactical estimate is also a military consideration, differing from the strategic in that it has more specialized application.

The logistical estimate is a survey of means for fighting.

These four estimates, it will be seen, follow in a logical chain in harmony with the relative time of their application. We will now consider them in detail.

I. THE POLITICAL ESTIMATE

"The state is a particular portion of mankind viewed as an organized unit."[1]

That it is said to be organized suggests that it is an active unit and that it has a purpose.

MISSION.—Just as the individual is given muscular activity that he may overcome obstacles to his existence and be enabled to serve society, so the state, through its united and organized activities of individuals, is enabled to promote civilization.

OPPOSING FORCES.—1. *Strength.*—This, of course, is a consideration that is represented by the sum of the forces of all other states, for, in theory at least, every other state has the same mission that we have, *i. e.,* to promote civilization. In other words, every state has a present and conscious, or a remote and probably unconscious, purpose to widely extend its manner of life, for, psychologists and sociologists tell us, it is a characteristic of man, as a social being, to dislike the exotic; it is his pleasure to bring all men to his own customs. Any people that is unconscious of such an ambition is either decadent or has not reached that stage of social development which warrants confidence in its own progress. Since the basis of social organization is that the individual is willing to surrender some of his own personality or, what are sometimes called "natural rights," for the common good, the state must stand ready to extend the hospitality of its civilization to the far corners of the earth. Now, a remarkable thing about civilization is that it is a benefit seldom appreciated by those to whom it is offered; the benefaction, therefore, is usually forced upon the donee. Therein we have our first occasion for a conflict of forces.

Then again, as every state is competing in these offers, there is very apt to be conflict between various would-be hosts, and we have another occasion for conflict. The full probabilities of friction cannot be foreseen.

Antagonistic forces, in the stateman's estimate, then, are the policies of foreign governments; at least, such policies are potentially antagonistic: they must be watched and analyzed for indications of relevancy to our foreign relations.

[1] *Political Science and Comparative Constitutional Law*—John W. Burgess.

A few centuries of history reveal constantly shifting alliances: the majority of the great nations have, from time to time, fought against, as well as in alliance with, most of the other nations. To mention only a few of these many anomalies: England and Germany, separately and in alliance, have fought France; England, within the century, has fought against Russia and is now her ally against England's former ally, Germany; Russia and Austria were once allies against France; now Russia and France are allies against Austria; Germany and Austria, now allies, were at war 50 years ago; Russia and Japan, most recent enemies, are now perhaps the firmest allies; this list of broken alliances might be extended. Suffice it to say that in counting the strength of opposing forces we must examine the conditions and circumstances of each foreign state. Although it is not at all probable that all states would combine against one, it is quite possible that several might so combine. In examining the circumstances of each one, its interests, and wherein the interests of one foreign state conflict or harmonize with those of another foreign state, we should obtain a fair estimate of the probabilities of combinations against us. In computing the strength of the opponent, then, we should look first for the sum of antagonistic policies, then for the various sums of forces represented by all possible combinations, for antagonistic policies entertained by two or three weak states would not be the same menace, nor call for the same remedy, as would such policies affirmed by a strong state.

2. *Location or Position.*—Under this head, the geographic position is considered, with reference to the bearing of various states' policies with one another. Certain policies held by two neighboring states might have a considerably different significance from like policies announced from widely different parts of the world.

3. *Quality.*—(a) The strength and efficiency of its government. (b) The cohesion of the people. (c) The density of patriotism. (d) The organization of fighting forces in general terms. (e) The general organization for assuring a constant flow of munition and other war supplies. (f) To what extent is civilian subsistence assured during war?

4. *Possible Courses.*—Pertinent to this phase of the estimate would be a study of the nation's history and psychology. What are the salient facts as to the causes of her past wars? Hence, what are the circumstances under which the national mass mind reacts belligerently? Such data should go toward making a good guide

to an estimate of the nation's present tendencies. Again, if, under certain circumstances, a nation pursued a certain course of action at one time, is it not quite probable that similar circumstances would produce similar results, with the same mass mind, at another time? If, for example, the nation before a previous war, was engaged in certain unusual activities in contemplation of a declaration of war, and if we find the same nation engaged now in similar activities, including a considerable propaganda agitating for another war, is it not logical to say that the nation contemplates another declaration of war?

A study of the national psychology may also discover something as to the nature of the commencement of hostilities: whether it will be a reluctant process favoring a possibility of a reconciliation to avoid war, or a surreptitious precipitation of an attack to obtain the fullest advantage of the element of surprise.

Will the opponent pursue any other courses that would be of interest to us diplomatically whereby conflicting interests might be reconciled, by mutual concessions? Is the opponent involved in any diplomatic negotiations with other governments that are tending to prejudice our relations or status?

OUR OWN FORCE.—1. *Strength.*—The statesman is interested primarily in diplomacy; it is particularly within his province to fight policies with other policies, and diplomacy is his natural instrument. Our strength, then, will consist in whatever policies we may be able to announce, and support, that will have a tendency to neutralize foreign antagonistic policies. The statesman must, however, be under certain limitations in his diplomacy, *i. e.,* his diplomatic pretensions cannot far exceed the national fighting power, for a challenged and unsupported policy may be void. A general survey of our own power for fighting must be made here in addition to the estimate of our diplomatic resources. At this point the estimate approaches very near to the strategic estimate. The latter, however, will be a much more detailed analysis. The statesman's comparisons, of fighting strengths, will be such generalities as the following: (a) Our actual strength available against the strongest combination that can be made aaainst us. (b) Our actual strength added to that of such allies as may be counted upon in case of war with a certain state, alone or allied.

2. *Location or Position.*—Here we consider the same matters that are presented under the estimate of the opponent, for the same sub-head, except that the view-point, for this side of the picture is

that of seeking out our circumstances that are especially material to those of the opponent and that may be employed to embarrass him, and of discovering such of our circumstances as may favor his schemes in order to find neutralizers. What is our position with reference to other states that might be considered our natural allies in the enforcement of mutual policies? Are our friendly neighbors in a position, politically, or geographically, to help us? What is our position with reference to states toward which our potential opponent is making advances diplomatically? What is our position with reference to his allies?

3. *Quality.*—The same facts would be investigated under this heading for both forces.

4. *Courses That May Be Adopted.*—Courses open to us would depend upon whether or not we were prepared for war, upon whether we wished to accept the threat as a challenge. Decisions as to this point should not rest entirely upon considerations of the advantages that might be expected to accrue to the present generation of our own people, but to the remote generations of the world. Since, however, we have confidence in our own product of civilization, our estimate would usually be that a threat to our progress should be destroyed as soon as our strength is equal to the task, and that the offensive is the surest defence. If, on the other hand, our strength is not sufficient to cope with the threat, we must endeavor to temporize, through diplomacy, until our strength is augmented either through the conversion of resources to fighting material or through the cementing of alliances.

CONCLUSION.—In the political estimate the scope of action is limited to the diplomatic function. The decision may state that a certain course of diplomacy fails and the estimate of the situation must be taken up by the national board of strategy. Or, there is, conceivably, one other case wherein the circumstances are such that the decision may be to adopt such and such a diplomatic course the issue of which is doubtful; hence that the board of strategy must consider the case to be prepared for eventualities.

Here we have illustrated the nature of the connecting link between policy and strategy, or between the political element of government and the fighting machinery. It is presumed that negotiation between states is ordinarily effected through political agencies, *i. e.*, through diplomacy, but when the mission cannot be accomplished through these channels, the responsibility for execu-

tion of the mission passes to the land and naval fighting forces. It is important to appreciate the exact statement of this theory in order that the governmental organization may be in harmony with theory. As peaceful negotiation is the normal condition, the agents thereof, being strongly intrenched, acquire the mental habit of supreme command, and the fighting machine is left immeasurably subordinate; it is, therefore, difficult for the political agencies of government to surrender any of their supreme authority, when their efforts at negotiation have failed, in the interest of giving to the military powers that authority which is essential to efficient action toward military success. Diplomacy having failed, negotiation with the opponent is as entirely in the hands of the military, as it was previously in the hands of the political, agencies, and success demands a no less absolute, if temporary, transfer of authority. It is important that a people should reconcile themselves to being a militaristic society during the progress of a great war to which they may commit their state. A governmental organization, to realize this ideal, may be a perfect republic if supported by a fighting machine based on universal service. There is no reason why the burden of defence should not be as generally borne as the burden of industry. The one is as much a prerequisite of continued existence as the other. When a people is indoctrinated with as great an interest in national defence as in industry there need be little fear of an attack.

But if the organization should provide for a militaristic status during war, it should also provide for a quick resumption of the political supremacy as soon as the application of military force has succeeded in eliminating effectual resistance to our political negotiations to accomplish our mission.

This again illustrates the importance of a government organization that provides a normal link between statecraft and strategy. History has too many examples of the lack of such a workable organization; during an epoch when the future existence of the state, as well as the happiness of every individual thereof, hangs upon military success, and when the whole national thought is centered upon the military, there persists the reluctance of the political agencies to transfer sufficient authority to insure efficient military administration.

The forging of this link depends upon the general will. When that is indoctrinated, legislation will create a properly constituted

national board of strategy. Never in any country have the people appreciated military necessities, and provided for them by legislation, except through the medium of universal military service.

II. THE STRATEGIC ESTIMATE

This estimate is properly the work of a national board of strategy, a statement of the composition of which will be deferred until we have discussed the functions of the board; then we will be able to select the personnel more advisedly.

As stated in the foregoing outline of the political estimate, the strategical survey is called for when the political agencies either acknowledge the inadequacy of diplomacy to accomplish the mission or express doubt as to the probable success of proposed diplomatic measures. In one case the political agencies say, "We transfer to strategy the responsibility for enforcing the mission." In the other case, they say, "We shall be obliged to transfer the responsibility to strategy if our present efforts fail. Be prepared."

MISSION.—What could not be accomplished through diplomacy is transferred to strategy for accomplishment through force. The problem for strategy is: How much force must be applied, what kind of force, and when and where may it be most effectually applied to discharge strategy's present responsibility?

At this point it may be well to define strategy in order that there may be no misconception as to the nature of the proposed division of labor between strategy and tactics.

Many authors have defined the different war functions with a variety of results due to their different points of view, or, rather, to the service they wished a definition to render their particular thesis. The best definition for our present purposes (*i. e.*, to indicate the division of war labors) is that given by Carl von Clausewitz.[2]

"Tactics," he says, "is the theory of the use of military forces in combat. Strategy is the theory of the use of combats for the object of the war."

If this definition is accepted, we are at once shown the jurisdiction of a board of strategy, *i. e.*, that it considers and disposes of all the fighting forces of the nation, on land and on sea. When less than the whole of the forces, say the land force or the sea force, is considered the thought is in the realm of tactics.

[2] "On War," by General Carl von Clausewitz, translated by Colonel J. J. Graham, London, p. 86.

It may be over-bold to assert this catholicy of strategy in view of such well-known titles as "Some Principles of Maritime Strategy"[3] and "Naval Strategy,"[4] but it should be noted that the author of the former has been severely criticized for attempting to show that war on the sea is fundamentally different from war on land,[5] while the author of the other title has been widely commended for "enforcing military analogies in order to show the existence and effect of a *single principle underlying* both naval and military strategy."[6] Since Admiral Mahan appears to have considered that strategy was the same whether applied to the military or naval employment, "Naval Strategy" as his title may be interpreted as "naval participation in strategy"; his thesis certainly supports the Clausewitz definition. That the latter is the most practical definition upon which to base a division of war labor is illustrated when it comes to the consideration of defence plans. For example, if the plans for the defence of Island A are under consideration by a board of army officers and by a board of naval officers, the two boards working independently, it is remarkable how widely the finished defence schemes will differ; but let this plan be constructed by a composite board of experts of both branches, and the plan will grow step by step, the reciprocality of views tending to provide for both land and sea necessities, or to subordinate the less important when the two conflict; the decision of such a composite board would, one might expect, be a wiser decision than one produced by a board representing either the army or the navy alone, because it would be based on a wider range of experience. The bi-service plan would have the further virtue of having the confidence of each branch. The method would be a logical consequence of regarding strategy as the theory of the employment of all the forces, etc.

ENEMY FORCES.—The strategic analysis will take up the consideration where the political leaves it; as the latter was more particularly interested in the psychological effect of policies and diplomatic measures, the former directs attention almost entirely to the physical problems of actual power. The survey must proceed in detail:

[3] By Mr. Julian Corbett, London.
[4] By Rear Admiral A. T. Mahan, U. S. Navy.
[5] See *The Spectator*, London, for March 23, 1912, pp. 477-478.
[6] See *The Army and Navy Gazette* (English), for February 3, 1912, p. 103.

1. *Strength and Composition.*—An inventory is made of all the known fighting forces of the opponent: the numbers of each class of war vessels; the numbers of each class of aircraft; the numbers of each arm of its land forces both in actual service and in reserve; the numbers of each class of artillery pieces; an inventory of other war weapons not implied in the normal or conventional employment of the "three arms." It should then make an inventory of all vessels available that could be converted to war uses, a list of estimates as to numbers of civilians that could be serviceable as soldiers with the length of time that it would take to qualify them, a list of their advanced bases, or places that could be so used, noting whether or not they are equipped for serving the fleet in every respect, or only partially.

2. *Location or Position.*—How are enemy forces now placed with reference to ability to mobilize and concentrate against us? How long before we reasonably may expect their first appearance in the zone of operations, and in what strength and where? At what rate can re-enforcements arrive to support their initial appearance? These calculations must be made with reference to every strategical point, *i. e.*, there will be a separate set of data for each of such points, so that we may be able to say that the enemy will, or can, appear at point X with a certain number of troops or ships, or both, within so many days, and at point B with a certain force in *so* many days, etc.

3. *Quality.*—(a) As the modern war implies the "Nation in Arms,"[1] the most pertinent inquiry will be directed to ascertain the density of the opponent's patriotism; this may be investigated in several directions among which we may mention: a study of his past campaigns will show whether or not his soldiers know how to die as they did under Napoleon-the-First during the epoch of his greatest achievements and as the Japanese did in 1904; a study of his criminalogical data will give some evidence of the people's general respect for the laws, hence their patriotism; a study of the routine of his school system will show whether or not patriotism is taught, for if it is not imbibed in youth it probably will not be deeply rooted in maturity; a study of the social order will show whether or not the masses have much reason to be patriotic; a study of the condition of the laboring classes will show something of the degree of patriotism that prevails, and it will also show what

[1] *The Nation in Arms,* by von der Goltz.

may be expected as to the opponent's ability to mobilize hands for all the activities during war to keep munition plants and auxiliary industries underway and free from strikes.

(b) A soldier or sailor may be patriotic and perfectly willing to give his life to the country, but if he is ignorant his value will be only a fraction of what it would have been if educated. To be a good reliable fighting man, he should react quickly to his surroundings: he must promptly appreciate the import of events in order that he may, on his own initiative, take the right action to prevent evil effects of the event to his own party, or, in positive action, make the most of the event to injure the enemy. To be equal to this responsibility, the humblest unit of the fighting machine must have knowledge of the natural laws not only in order to understand cause and effect in a practical way but that the normal development of his mind through acquiring such knowledge will tend to give him a normal mental attitude. The quality of the fighting machine will, then, be largely dependent upon the educational system; a study of that system will considerably aid in our estimate of the quality of the "Nation in Arms." It should be stated here that by *education* is meant not only the acquirement of information but the normal development of all the faculties.

(c) The physical qualification of the enemy fighting unit is, of course, an important consideration; if our physical average is much lower than his, we shall have to attempt to make up for the physical deficiency by an increase of numbers. The first step would be to obtain pathological data from published reports; this would show the physical condition of the nation under normal domestic conditions; but we desire to know how he will respond to the conditions imposed by a campaign; to that end we might investigate along the following lines: Is a large proportion of the industries of the country such as would be expected to develop a hardy race? Is the native climate one of extreme seasons or of fairly even temperature? In other words, are the natives inured to the hardships of extreme heat and cold? Is the native dress such as tends to harden the body for exposure? Is the native population sensitive to its food requirements, *i. e.*, must the native have a particular food or a considerable variety of food, or is he to a considerable extent, compared with other races, independent of the food question? Is the nature of the country and of the employments

such that the native population uses its legs for locomotion to a large extent, as in Japan and China where there are so few means of transportation other than the jin-rikisha, or to a small extent as in the United States where trolly cars, automobiles or horses are seized upon by everyone for a move of any distance more than a hundred yards? (In this connection attention should be called to the fact that the principal medium of carriage in Japan and China develops a large part of the population to a remarkable marching capacity, for, as is well known, the "jin," or man part of the jin-rikisha, trots and hauls his load for miles on a stretch, and can even run for long distances.) Are the native living accommodations generally such as cultivate a physical reliance upon a mattressed bed, as in the United States, or a physical independence of such luxuries, as in Japan where no one sleeps upon anything softer than a thinly matted floor? If the ordinary habits of the people do not require many more accommodations than are available at the front in a campaign there will be a much higher percentage of effectives present for duty than in an army composed of people that are largely dependent upon comforts that cannot be had in a campaign.

(d) The state of the opponent's technical training is, it scarcely need be said, an important consideration. Even patriotism of the highest order, amounting to complete self-abnegation, cannot be a substitute for technique. Skill must extend to every rank and to every kind of employment, but it may safely be said that if the officers are well trained the lower ranks are surely to be so, too, for the officer's education will tell him that his own preparedness will be useless without trained instruments for applying his knowledge and skill—trained men for the execution of tasks, and as every officer appreciates this truth he sees that men under his command *are* educated. We will, therefore, particularly investigate the enemy's methods of educating officers; if they provide for education in the science of war as well as in the use of mechanical instruments of warfare, and if the means of acquiring such instruction are widely distributed so that it comes to every officer as a part of his routine of service, it may be concluded that the whole service is well trained.

(e) Patriotism, physical fitness, education and technical training are not all the cardinal qualifications necessary to the personnel to assure efficient and concerted action in large organizations; the

organization must be *indoctrinated*. Without this quality, separated units lack a certain mental cohesion or harmony that is demanded to meet the sudden precipitation of an unexpected, and unprovided for, situation. The commander issues orders based on such information as is at hand, but it often happens that by the time the orders reach a subordinate commander for execution a new situation arises under such circumstances that it is impossible to report the change of conditions to the superior officer and ask for new orders; the subordinate must estimate the situation through his superior's eyes and must reach a decision that would be the superior's decision if he were present and acting; if the junior can do this he is indoctrinated. Another case of indoctrination would be where Admiral A, commanding a fleet, issues orders to two distant and separated divisions to scout certain areas, finally forming one line; if Admiral A and the two divisional commanders have been educated in the same war college they have acquired similar methods of military thought; at least they have learned that certain methods of scouting are appropriate to certain conditions; Admiral A's order can be much shorter to these indoctrinated subordinates (whom he knows and who know him) than the order would be to strangers. Therefore, we shall wish to know whether or not the enemy's army and navy are indoctrinated, and, if possible, we should like to learn what his principal military doctrines are; that information will be useful in aiding us to estimate what course the enemy will probably pursue under certain conditions that arise during the campaign.

COURSES OF ACTION OPEN TO THE ENEMY.—Deductions from a consideration of his strength, position and quality in reference to the issue pending with us. As a suggestion of what is required under this caption we may take the following:

(1) He can concentrate a fleet of 24 dreadnoughts, 8 battle cruisers, 60 destroyers and 8 fleet submarines, with a complete train, as escort for an army of 6 corps in transports, to attack our strategic point M within 7 days.

(2) He can concentrate a fleet of 24 dreadnoughts, 16 predreadnoughts, 8 battle cruisers, 84 destroyers, 8 fleet submarines, with a complete train, as escort for an army of 6 army corps in transports, and be off our strategic point N within 10 days.

(3) He can concentrate a fleet of —— ships (numbers and classes) to dispute the command of the sea with us in the Atlantic by —— (naming a date).

(4) He can mobilize a fleet of —— ships (numbers and classes) and leave his home base to attack us by —— (date), keeping us in doubt as to whether his objective is our most southern strategic point, or our most northern, until our scouting line can develop a considerable part of his force.

In estimating what the enemy may do, every conceivable course of action that is open to him should be recorded for analysis.

HIS PROBABLE INTENTION.—This is the selection we make after considering all the courses of action the enemy might adopt. One guide to this discovery is to ask which of the possible courses would be most injurious to our side. Of course, we usually would be in the dark as to how much information the enemy has about our situation; hence he may not see what would be most injurious to us, but it is always best to make the maximum allowance in the interest of safety—to assume that the enemy knows all and will detect our real vulnerability. In estimating what the enemy will think we should not fail to take account of his psychology—as to whether his manner of reasoning is different from our own. For instance, an ancient principle of Chinese tactics was that the plan of battle should exclude the possibility of providing a line of retreat. We must understand what the enemy's fundamental principles are in order to understand what premises he will use in reaching a conclusion. The estimator must attempt to assume the mental attitude of the enemy while guessing about the latter's decision.

OUR OWN FORCES.—Here we have the other side of the picture, and we must note that the reverse should meet the obverse step by step and point by point.

1. *Strength and Composition.*—An inventory is made of all our own fighting forces, classifying in the same order as with the enemy. We must consider not only the forces that are available for timely mobilization but those that are trained in reserve and those that may be brought into service later. The classification will show wherein, if at all, we are deficient.

2. *Location and Position.*—Having in mind the courses of action that are open to the opponent, which usually will be expressed in terms of concentration upon one or more strategic points, a canvas of the distribution of our own forces will show what the possibilities are of effecting counter-concentrations. The value of the defensive as well as of the offensive should be considered with

reference to conditions existing in the whole theater as well as in the various zones of operation. As the offensive depends upon the possibility of concentrating superior forces ("superior" having reference to the aggregate superiority after weighing and comparing numbers, organization and morale), it cannot be undertaken without assurance of being sustained. The offensive means the protection of long lines of communication, usually, and such protection makes heavy demands that dangerously reduce the force left for the actual operations at the front.[8] In short, we must compare the position, and situation, of all the elements of our own forces with the corresponding features of the enemy's in order to see what we may do.

3. *Quality.*—How do we compare with the enemy in patriotism, physical fitness, education, technical training, and in thoroughness of indoctrination? In what respects are we superior and how, if at all, will such superiority permit of a modification of the quantity of forces that must be provided to obtain the aggregate superiority? In what respects are we inferior and how can we make up for such inferiority by increases in numbers or by taking advantage of position? In what respects can we remedy our deficiencies before the outbreak of hostilities and even during the continuance of the war?

COURSES OF ACTION OPEN TO US.—Set forth all these for examination.

DECISION.—In an offensive strategy the aggressor, of course, attempts to dictate the course of the campaign by seizing and holding the initiative himself so that the only course left to the enemy is to follow on the defensive. The great advantage of the offensive is that the aggressor may choose the time and place of fighting, *i. e.*, terms favorable to himself. But one side seldom has sufficient superiority of all forces to warrant the offensive in all his employments; he may be superior in land forces but weak in the maritime element, in which case he could assume the offensive only with his army; or vice versa. Or he may be attacked by two enemies from different directions; then he would be reduced to the defensive in at least one direction. In Moltke's estimate of the situation, made in 1866, plans were presented for meeting both France and Austria at once, holding the latter defensively while an offensive campaign should eliminate the former. An alternative

[8] See "Elements of Strategy," by Lieut. Colonel G. J. Fiebeger, U. S. A., Chapter V.

plan contemplated meeting France alone, in which case Moltke entertained no doubt as to the Prussians being able to keep the initiative. He gave careful consideration of what the French might do, and his analysis of French psychology is a conspicuous feature. After stating that the enemy could concentrate an army of 150,000 on the frontier in "a very short time by emptying the garrisons and camps in their northwest territory, he says:

> This carrying out of a rash initiative is in accordance with the national character, and has *been discussed in military circles.*[9]

While Moltke indicated the enemy's probable intentions, his plan was so drawn that it provided for the possibility of changing the Prussian dispositions to meet any other course the opponent could, conceivably, take.

Our decision should, then, aim to meet any course the enemy may take, but particularly the course he probably will adopt.

The strategic decision, once decided upon, takes shape in the form of an order in two parts—one for transmittal to the Navy Department as the order for the employment of the navy in the war; the other to the War Department for similar use.

* * *

Occasions for the estimate of the strategical situation will continue to arise throughout the war. The Board of Strategy will watch the progress of tactical executions as well as the political and industrial situations abroad, and be ready to take advantage of any favorable change. Our successes may lead to a new estimate that will reveal the possibility of undertaking a more ambitious offensive; on the other hand, reverses may necessitate the substitution of the defensive for the offensive in certain fronts. So also, the progress of the war may disclose the futility of continuing it and suggest the probability of obtaining better peace terms than will be offered if the enemy multiplies his victories and increases his territorial occupations; or the estimator may be convinced that his side has already substantially reduced the enemy's resistance and that peace terms should be suggested to him.

Strategy should ever be ready to join hands with diplomacy—ready to withdraw the supremacy of force in favor of the supremacy of reason.

* * *

[9] See "Extracts from Moltke's Correspondence Pertaining to the War of 1870-1871," translated by Harry Bell.

As promised at the beginning of the discussion of the strategic estimate, the composition of the Board of Strategy must be considered. We have seen something of the work that must be done, and should now know how to select the workmen.

It goes without saying that there should be on the board at least one army, and one navy, representative to evaluate the military situation. We have seen the importance of an intimate connection between policy and strategy, and that there should be a cordial mutual indoctrination so that authority over, and responsibility for, certain international relations may expeditiously pass from the political department to the military when diplomacy fails, and from the military to the political when force has succeeded, or failed, in breaking down resistance to our policies. The connecting link should be a representative of the Ministry of Foreign Affairs, say the Minister of Foreign Affairs himself (called Secretary of State in the United States). To the work of the board, he will contribute authoritative advice as to relations with foreign governments, and, on a certain day, will say to the remainder of the board, "Diplomacy fails; the responsibility is transferred." He will also advise the board as an expert on international law.

The political head of the department of the land forces and the political head of the department of the sea forces should also be members, because they represent their respective departments' needs to the national legislature, and the sessions of the board will largely indicate what those needs will be in general terms.

A sixth member should be the head of the National War College, for the benefit of both the board and the college. Incidentally, it should be said that as there is not a separate strategy for the navy and for the army, there should be only one war college, in which both army and navy officers participate. A war college exists for the purpose of studying war from the strategic point of view; almost every campaign involves both sea and land forces: a naval expedition needs the help of the army to hold home bases and possibly some of its advanced bases; a land campaign needs the help of the navy to keep open sea communications, to escort overseas expeditions, etc. As war is to be fought in coordination between the land and sea forces, it should be studied in such coordination. Thus may the navy appreciate the military equation, and vice versa. The specialties—naval tactics and logistics, and army tactics and logistics—should be studied in naval and

military staff colleges, some time after the primary education of the naval and military academies.

A seventh member should be the chief of a National Bureau of Intelligence (which should be the only bureau of intelligence). The " raw material " with which the Board of Strategy is employed consists largely of the information that can be collected from abroad. The organization must, then, provide for the closest alliance between the Bureau of Intelligence and the Board of Strategy.

By providing that the head of the War College and the head of the Bureau of Intelligence should not both be either army officers or navy officers at the same time, there would be an assurance that there would always be the same number of representatives from the navy as from the army on the Board of Strategy.

It appears that some of the governments engaged in the present war have had much difficulty in maintaining a workable war cabinet or board of strategy; they have found that numbers cumbered action; the tendency has been toward reducing the number of members. The board should not be larger than seven voting members; each of these may have as many working assistants as may be necessary. In short, the Board of Strategy should be a great institution with large facilities for work and small restrictions to its power for quick decision.

III. THE TACTICAL ESTIMATE

The strategical order having been transmitted to the army and navy heads, becomes the basis of an estimate of the major tactical situation by the navy general staff, for the navy, and by the army general staff for the army. These estimates follow the logical lines of the strategic consideration. The same form will cover the major, and minor, tactical situation. There are some small differences in the forms at present in use in the army and navy.

The Navy General Staff and the Army General Staff carefully study the strategic order to ascertain, respectively, the navy and army missions and the terms of cooperation defining exactly where navy responsibility and authority end and army responsibility and authority begin. The mission will be a tactical task. The navy may be directed to blockade certain ports, to destroy enemy commerce, to seek out the enemy fleet and destroy it, to provide escort for an overseas expedition, etc. The army may be directed to conduct

an offensive land campaign in one zone of operations and a defensive campaign in another zone, or to dispatch an expeditionary army to occupy certain foreign territory, or to mobilize and concentrate in a position of readiness to await developments, etc. Whatever the mission may be, the respective general staffs estimate the situation to determine how the mission will be executed.

NAVY METHOD[10]	ARMY METHOD[11]
ENEMY FORCES	ENEMY
Strength.—Numbers of each class of war vessel, the number of guns of each caliber, speeds, and steaming radii.	*Strength.*—Numbers of troops in each arm in the active army and in the qualified reserve. Numbers of partially trained civilians and the length of time required to qualify them for duty on the line of communications, etc. Numbers of guns of the different calibers, aircraft of different classes, etc.
Disposition.—What is his present distribution of forces? What parts can he concentrate against us, and how much time will such concentration take? What sea routes are available to him, in view of meteorological conditions?	*Position.*—How are his forces distributed at present? What forces must he leave in observation upon other forces than ours? How is his present position affected by the terrain? What routes are available to him and what is their length and condition in respect to marching and security? Will ground that he will occupy be difficult to entrench? What is his base and line of retreat? Where is he most vulnerable—in the center or on one of the flanks?
Probable Intentions.—All the courses that the enemy might, with reason, pursue should be set forth. These courses are deductions from data known in regard to his strength and disposition. Of such courses the one that appears most dangerous to us would, ordinarily, be the one he would select.	*Probable Intentions.*—The same comments are applicable to the army as to the navy under this caption.

[10] See "Estimate of the Situation," Rear Admiral Austin M. Knight, U. S. N., NAVAL INSTITUTE PROCEEDINGS, No. 157.

[11] See "Technique of Modern Tactics," Bond and McDonough, p. 18.

OUR OWN FORCES
Strength

OUR OWN FORCES
Strength

Same classification of data as mentioned under the same heading of Enemy Forces, followed by a comparison wherein our superiority, as well as our deficiencies, will be discussed.

Disposition

Position

See similar step under Enemy Forces.

Courses Open to Us

Courses Open to Us

All courses presented in detail.

Decision

Decision

Of the courses of action open to us we select the one that we believe best answers the enemy's probable intention. The statement of this selection is our decision, or what we intend to do. This will be amplified by stating how we propose to do it—the plan.

IV. THE LOGISTICAL ESTIMATE

It has been explained in previous pages that strategy and tactics are theories of the *employment* of military forces.[12] Logistics is the science of war preparation: it is the organization of the business functions necessary for the maintenance of the fighting forces in all their requisites at all times and in all places.[13] Hence, it is through logistical agencies that tactics obtains all its means of fighting battles. It is well enough to speculate in the realms of strategy and tactics, but until we have applied the realities of logistics, we are merely soaring in the mental atmosphere of pure theory. Making plans for a campaign, or, indeed, for a single battle, without testing every contemplated step to see whether or not it is logistically possible, is like building "castles in Spain." A very large percentage of military failures are merely logistical failures, *i. e.*, the campaign or battle plan was projected without due regard for logistical limitations.

That for ages military men have appreciated the importance of food supplies is attested by the frequency with which we hear or read such expressions as "An army fights on its belly." But it does seem, in reading the accounts of campaigns, that, having learned this truth about food, commanders too often have con-

[12] See *ante*, p. 17.

[13] See "Precis de l'Art de la Guerre," Baron de Jomini, Ch. vii.

cluded that armies fought on nothing else. (Beware of the shibboleth, or pet phrase!)

Logistical failures, as, for example, Napoleon's Russian campaign, have not always been due to poorly qualified staff officers, but to the fact that their services have not been properly mobilized; logistical organization is a conception too modern to be generally appreciated; great lessons are being learned therein during the present war; it had not progressed far before the whole world saw the importance of elaborate preparation during peace times. This preparation can be thoroughly accomplished only through organization of the means of making war—a coordination of all the elements that aid the fighting.

If plans are valueless unless and until they have been subjected to the logistical test, it would seem beyond dispute that organization should provide for the normal operation of the complete logistical function—the coordinated employment of all the agencies for providing the means of fighting. That is to say, wherever there is a tactical staff there should be a logistical staff to which the tactical estimate, or, at least, the tactical decision, should promptly pass for subjection to the logistical estimate to determine: (1) whether or not the submitted tactical plan is susceptible of execution with the means that will be available within the time limit involved; (2) or what must be done by the various logistical agencies to prepare for the tactical execution; or (3) possibly, the logistical staff might say that means could be provided for the tactical plan presented with some minor exceptions; the tactical staff might then modify its original plan to meet the logistical deficiencies. For example, a naval tactical decision might call for scouting to be done by certain units of coal burning vessels; the logistical estimate might disclose that coal could not be provided in sufficient quantities at the right place in proper time to meet tactical demands but that oil fuel could be provided. Thereupon the tactical staff might be able to substitute oil burning vessels.

At this point we must recognize that there are two principal classes of tactical situations, from the point of view of the estimator: first, the situation that can be contemplated deliberately, as in the beginning of a campaign before fighting has taken place, or where the estimator controls the initiative and need not go forward until he is ready; second, the situation that calls for a quick decision, as in the rapidly developing stages of a battle. In

the first class, there may be plenty of time for referring the estimate back and forth between the tactical and logistical staffs, and the tactical decision finally to the logistical staff for execution. As to the other class—the quick decision case—it may be said that just as the tactical staff is continuously estimating the decision so that it may never be surprised, the logistical staff should be in close touch with the tactical staff and alert to possible requirements while each member keeps abreast of the minute in information as to means that are available to meet any possible demand, constantly anticipating needs and making provisions for meeting them. This ideal can be realized only if the organization provides for a logistical staff comprehending all the auxiliary services. These representatives, working together constantly, will inevitably fuse into one mass mind so that they will be working as a unit to a common end. Supported by a logistical staff of this kind, the tactical staff should be able to make a quick decision with confidence.

With this premise as to our logistical organization, we are ready to consider the method of the estimate.

As in other estimates, the first step is to discover the *mission.*

In general terms it is to provide means for the execution of the tactical decision. This at once suggests that whereas the principles of fighting are identical for land and sea forces, their respective means of fighting are very different. In the land fight, the *pièce de résistance* is a mass of infantry whose principal calls to the rear are for food and ammunition that come up in sensitive lines of communication. In the sea fight, on the other hand, the bulwark is the fleet of dreadnoughts complete within themselves in fighting means, at least for one battle. On land, it is much more a fight of men than on the sea where it is a fight of machines. In other words, a few thousands of sea fighters can manipulate their machines to obtain a fighting power equivalent to that of an army of some millions of men. The great difference in the means of fighting demands that quite different forms for estimating the logistical situation be presented.

(A) NAVY LOGISTICAL ESTIMATE

The general mission is a restatement of the tactical decision. There would always be also a special task for each department of logistics. While the staff as a whole would say that the mission

was to further in every way the execution of the tactical decision, the various members would have in mind their respective specific performances. The medical member of the logistical staff, for example, would say, " My mission is to reduce to the minimum the number of ineffectives." The naval construction and mechanical engineering representatives, on the logistical staff of a fleet, might have the mission of providing repair facilities at an advanced base.

DIFFICULTIES OF THE SITUATION.—(A situation always presents, more or less strikingly, the condition of opposition of forces —there is always something to be overcome. Here, the opponent force consists of difficulties while " our own force " is the combination of means that we can muster to overcome difficulties.) Sometimes, the logistical board may be able to record under this caption, the word " None," where the difficulties are not more than normal: the logistical problem can be solved " by inspection." Difficulties may be stated as contingent upon the enemy's conduct or upon our own progress; *e. g.*, " If our scouts do not make contact with the enemy within four days, certain scouts would have to be refueled," or " If the enemy begins operations on our line of communications by the tenth instant we shall have to increase the number of our fuel ships by 50 per cent."

Means Available for Neutralizing Difficulties Foreseen.—These means will be itemized to balance the next preceding paragraph.

COURSES OPEN TO US.—Here would be enumerated the several plans for providing all the means for executing the decision of the tactical staff. Some of the plans would be alternative to provide for contingencies; *e. g.*, " If the enemy occupies our Advanced Base X, we are prepared to shift the terminus of our line of communications to Island Y." The courses of action would include all the possible plans considered by each representative on the logistical staff.

DECISION.—Adoption of each representative's best plan absolutely or contingently (depending upon further developments).

(B) ARMY LOGISTICAL ESTIMATE

MISSION.—As in the navy estimate there must always be a general and a special logistical mission.

DIFFICULTIES OF THE SITUATION.—All sorts of difficulties may occur to prevent the operation of well-laid logistical plans in a land campaign: if the enemy makes unexpected advances one of

our supply routes may be cut off; enemy aircraft may destroy an important bridge, etc.

MEANS AVAILABLE FOR NEUTRALIZING DIFFICULTIES FORESEEN.—It is the business of the logistical staff to exercise its imagination in an effort to foresee everything the enemy may do in order to prepare measures in reserve to substitute for the course that is spoiled by the enemy's action. A good logistical estimate, then, will not only discuss all the courses that the enemy may take that will help or hurt our logistics, but it will provide a plan for every contemplated contingency. The most classical example of such a logistical achievement on a large scale is the case of Napoleon's provision for a change of base and line of communications at the battle of Austerlitz. It will be remembered that Austerlitz is north of Vienna. The allied Austrians and Russians, coming from the east, thought they could defeat Napoleon by cutting his line of communications with Vienna. The allies were disastrously defeated, and Napoleon had his most brilliant victory, because, foreseeing the allied plan and baiting them to it, he had quietly opened a new line of communications, perpendicular to his first, from Brunn through Bohemia.

COURSES OPEN TO US.—Same as in navy estimate.

DECISION.—Select the best course. See navy estimate.

* * *

Much light may be thrown upon the enemy's probable intentions by studying his logistics. This may be difficult by reason of lack of sufficient information, but the maximum effort should be made both before, and during, the war, to obtain the fullest data about his resources, his organization for converting resources to fighting uses, and his logistical requirements. As an example of the last-named item might be mentioned the rate of consumption of fuel for the different ships of his fleet, food requirements of his soldiers and civilian population, etc.

* * *

This is an age of positivism.[14] As soon as men generally learn that there are positive methods of calculating about the probabilities of there being a war, the chances of winning, and the proper disposition of forces, they will be eager for formulæ. A civilian of this kind from the middle west was in the Congressional

[14] See "A General View of Positivism," Auguste Comte.

Library the other day. He had accidentally discovered that war was more or less an exact science, and he was earnest for data.

"Why," he said, "the people would eat up books about war, weapons, and every sort of fighting means, if the military people would only produce the literature. The trouble is there is so little written about that sort of thing in this country that the public appetite has never been cultivated."

Quite in harmony with the modern demand for concrete statement are some formulæ that are deduced in a foreign publication [18] for comparing armament, showing the value of concentration, etc. For the process of the mathematical deductions reference should be made to the publication cited.

The first proposition proved is that "the fighting strength of a force may be broadly defined as proportional to the square of its numerical strength multiplied by the fighting value of its individual units."

The cited publication gives as an example of weapons of different effective value, the following: If, by experiment, it is found that a machine gun can punish a target to the same extent as 16 riflemen, how many men armed with the machine gun would be required to replace a thousand riflemen? The respective fighting values of a rifleman and a machine gun are 1 and 16. Let n equal the number required. Then $n^2 = \frac{(1000)^2}{16}$, or $n = \frac{1000}{4} = 250$. This result is probably true for the condition of individual-aimed firing, or sniping, but when the conditions are such as to preclude thorough rifle concentration, the value of the individual machine gun operator becomes more nearly equal to that of the 16 riflemen.

Applying to naval forces the above quoted first proposition (the "n-square law"), we must consider two principal cases, *i. e.*, (1) for a homogeneous force, "the fighting strength of the whole force is as the square of the number multiplied by their individual strength"; and (2) for a heterogeneous force, "the fighting strength will be the square of the sum of the square roots of the strengths of the individual units."

For purposes of comparison we may say that the fighting value of the individual ship is measured by the weight of the discharge of its gun fire, and where ships carrying guns of the same caliber are compared the individual fighting value may be expressed in terms of the number of its guns.

[18] *Aircraft in Warfare*, F. W. Lanchester, London, 1916.

The *n*-square law is much more applicable to naval than to army comparisons because conditions are so much more nearly uniform in the naval element. In fact, it would seem that the law would be of practical value in nearly every phase of the naval estimate.

SUMMARY

Knowledge of the methods of estimating the situation is restricted to the few—to professionals interested in such problems. Calculations in warfare are unknown to the mass of the voting population. The popular strategic estimate consists in the belief that we whipped the mightiest of nations twice and, therefore, that we should be able to defeat any nation now or later. Our popular decision is that, " If a foreign army should land in this country, a million men would spring to arms between sunrise and sunset." The corresponding tactical estimate is, " It is a long way from New York or San Francisco to Chicago." The political estimate hangs upon the other two, and the *decision* is, " We may do as we list." These are shibboleth estimates executed in shirt-sleeve fashion.

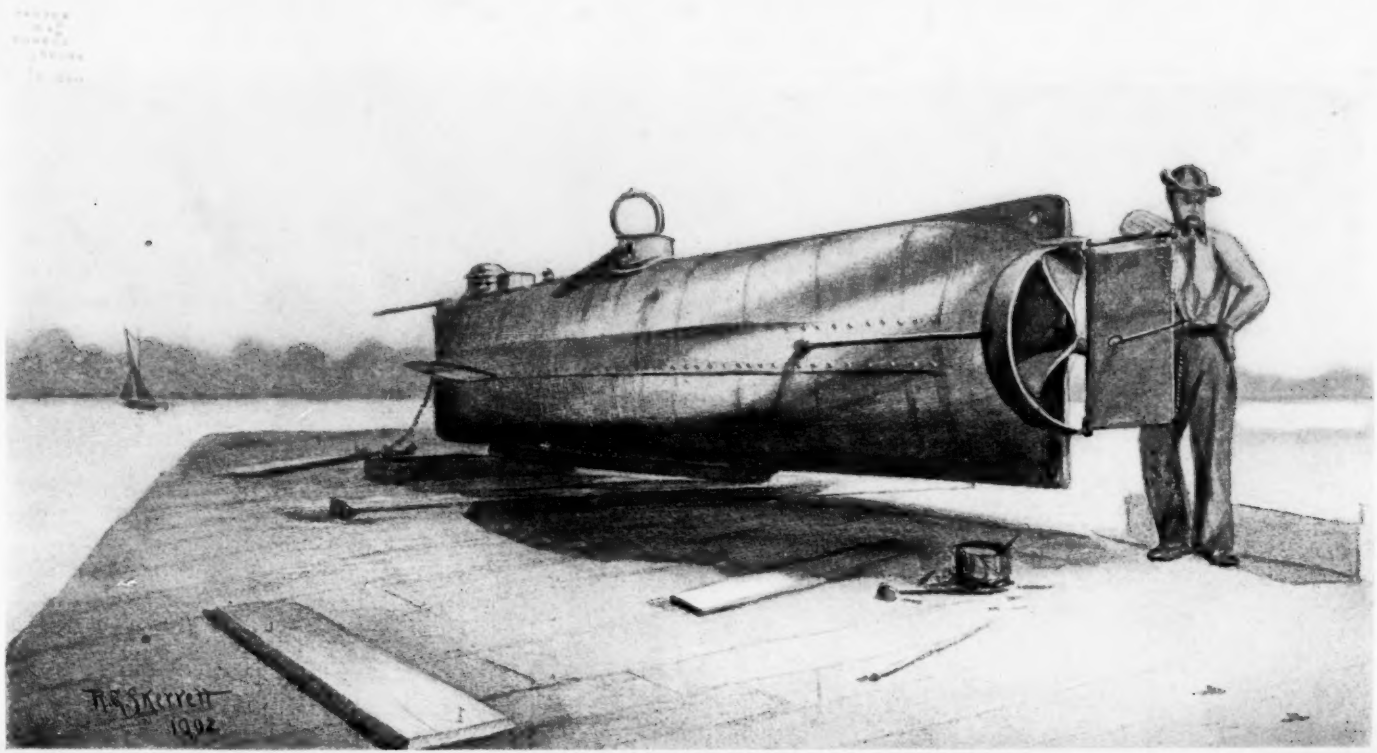
Although legislation depends upon the general will, no effort seems to be expended in educating the general will as to the international situation. If the land and sea forces are insufficient to support American policies, the civilian is about as much interested in discovering that fact as the military. His home, his property, and possibly his life depend upon the adequacy of his country's fighting power. Representatives in the Congress know that " the people back home " desire them to vote appropriations to maintain a sufficient fighting force to guarantee the country's security. To secure provision for military requisites it is only necessary that the voter and his Congressional representative discover what they are. Testimony before military and naval committees are usually so hopelessly contradictory that no judicial mind could reach a verdict thereupon. Since it is man's nature to value his own discoveries, the most promising way of enlightening the general will would be to put the method of estimating the situation at the disposal of everyone; the political and strategic situations will then soon be generally understood.

It may be said that an analysis of the international situation is available to every citizen who will read the newspapers, and possibly a little in the current magazines, and who will draw conclu-

sions from what he reads. A nation's policy is the policy of the people in these modern days of democracy. In every country, the government is anxious about the general will. When dominant statesmen have ideas as to what policy should be adopted in foreign relations they begin by educating the people to demand that policy. The newspapers participate in the propagandism. In every part of the country the leaders speak to the people; their speeches are widely published, in order to reach the widest number; thus the new doctrines, in every part of the world, are served at your breakfast table—in the news columns. Sometimes when a policy is being incubated in this way, a foreign government detects therein a menace to existing good relations between the two governments; when this discovery becomes known to the country of the propagandists one of its statesmen reassures the alarmed country saying that the reported utterance is not representative or has been misunderstood. An estimate of the political situation, however, serves to collect and arrange all the evidence, pro and con, as to the international situation, and anyone who has even a superficial knowledge of political history may reach a reliable conclusion. Every citizen owes it to himself (or herself) as a voter to formulate an estimate in this matter.

The strategic estimate is also within the reach of the civilian. There are various annuals that publish statistics of the resources, applied to military purposes and not applied, of all the governments. Employing these data and the form of the estimate, any person can make an illuminating strategical estimate.

The shibboleth of "Preparedness" has moved public opinion to the advanced stage of being willing to admit that "a certain amount of preparedness is reasonable insurance," *i. e.*, it is admitted that there *may* be as much probability of our going to war as that our houses will be struck by lightning. Public opinion is still superstitious about something that has been a reality of all the ages, and the most potent influence in history, war. If public opinion reasons at all about the probabilities of a rupture of international relations it reasons with meager facts, with the certainty of reaching erroneous conclusions. It always has been so. "Truth is unattractive. Error charms." It took a long time to discover that the world is round. It is taking a long time to discover that there is an "Estimate of the Situation" that is reliable. Let us hope that the time for the general acceptance of the discovery is near at hand.



CONFEDERATE STATES SUBMARINE TORPEDO-BOAT "H. L. HUNLEY"
Prepared from painting in museum of the Confederate Memorial Literary Society, Richmond, Va.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

THE PIONEER *IRONCLAD*

By JAMES MORRIS MORGAN,

Aide de Camp of Commodore Hollins, C. S. N.

Most people generally prefer to gather their historical lore from popular rumor rather than to laboriously search official records for their facts. For instance; the public press at the present time (1916) is full of patriotic suggestions as to where a suitable place would be at which to enshrine and preserve for the admiration of future generations the once scrapped hull of the first (?) submarine boat, the one built by "Holland," the writers seemingly convinced that she was the original under-water craft despite the fact recorded in naval annals that 30 years or more before Holland designed her the Confederates not only built the little submarine *Hunley,* which bore the name of her inventor, but with her they sank the U. S. sloop-of-war *Housatonic* off Charleston, S. C., on February 17, 1864.

A similar erroneous idea prevails, among the misinformed, that the *Merrimac,* the famous adversary of the *Monitor,* was the first ironclad ever engaged in battle when she attacked the wooden frigate *Congress* and the sloop-of-war *Cumberland* in Hampton Roads in March, 1862, while the fact is indisputable that five months prior to that fight (October 12, 1861) the Confederate ironclad ram *Manassas* was engaged in an attack on the Federal fleet at the head of the passes of the Mississippi River, in which engagement she rammed the U. S. S. *Richmond* carrying twenty-two 9-inch guns (at that time).

There are two participants in that affair known to be still living. One of them is Captain H. H. Marmaduke and the other is the writer of this account; both of them were midshipmen on board of the Confederate flagship *McRae* at the time, and Marmaduke was severely wounded while on the *Merrimac* during the battle of Hampton Roads.

CONFEDERATE STATES SUBMARINE TORPEDO-BOAT "H. L. HUNLEY"
Prepared from painting in museum of the Confederate Memorial Literary Society, Richmond, Va.

In 1861 Flag Officer George N. Hollins was ordered by the Confederate authorities to the command of the naval defences on the Mississippi River. He had been a midshipman on the U. S. frigate *President* when she was captured by the British in 1812. In 1854 while in command of the U. S. S. *Cyane* he bombarded the Nicaraguan port of Greytown (San Juan). He laughingly described his experience by saying that "while some people wanted to have him court-martialed for his act, others thought he ought to be made president, and as his conduct on that occasion was becoming a political question, politicians settled the matter by getting him the command of a better ship, and having him sent as far as possible from temptation."

At the outbreak of the Civil War the commodore was in the Mediterranean flying his flag on the side-wheel frigate *Susquehanna*. He brought his ship home to a northern port, turned her over to the U. S. Government, resigned his commission, and went south. His first adventure in the Confederate service was to board the *St. Nicholas,* a steamer plying between Baltimore and Washington, and with several other southern sympathizers register themselves as passengers, and then forcibly capture the boat as soon as she was fairly out in the stream. With the *St. Nicholas* he took several small prizes.

Lying at New Orleans in 1861 was an ocean-going tug called the *Enoch Train*. This boat had been purchased by a small company of speculators whose love of dollars was greater than their affection for the Confederacy. They caused the upper works of the tug to be removed and then had built a turtleback of 12-inch oak which completely covered her. This wooden protection was made the backing for a light armor of railroad iron, the "T" rails being dovetailed into each other and forming a metal protection about four inches thick and almost solid. She carried one 32-pounder mounted in her bows. The port was so small the gun could neither be elevated nor depressed, and as there was not sufficient room, there were no traverses or other means of training the weapon except by the helm. The gun was only expected to be used at the moment of collision with an enemy vessel.

When ready to be put into commission the *Enoch Train* was rechristened *Manassas,* and her patriotic owners proposed that the Confederate authorities enter into a contract to pay many thousands of dollars for each Federal warship destroyed. The Rich-

mond Government refused the offer, and the ram, manned by a loud-mouthed set of toughs, lay idly at her anchor on the Algiers side of the river, opposite Jackson Square and the old St. Louis Cathedral.

The distance from the Passe à l'outre to the Southwest Pass of the Mississippi is some 27 miles, and the river has four principal mouths, widely separated from each other, necessitating a large number of war vessels to make an effective blockade. The Confederate cruiser *Sumter* had recently escaped to sea. To shorten the blockade line Flag Officer W. W. McKean, U. S. N., ordered Captain Pope to proceed up the Southwest Pass with the sloops-of-war *Richmond, Vincennes,* and *Preble,* and the gunboat *Water Witch,* and take possession of that part of the river immediately above the wide sheet of water known as "The Head of the Passes" and thus make it impossible for either the *McRae* (which cruiser was ready to put to sea) or any commercial blockade runner to get by, as the river was only about a mile wide where the fleet took up its station. New Orleans was in this way not only bottled up but the cork was squeezed in.

Commodore Hollins determined, if possible, to drive the Federal fleet away from their position of vantage, and to effect this purpose the only vessel he had under his command which bore the slightest resemblance to a war ship was a small bark-rigged steamer carrying seven guns called the *McRae.* This steamer under the name of *Marquis de la Habana,* and her consort, the *General Miramon,* were the property of General Miramon, a Mexican revolutionary leader. They were captured near Vera Cruz by the U. S. sloop-of war *Saratoga* in 1860 after quite a lively fight in which some 22 men were killed and wounded. The prizes were sent to New Orleans, the *Marquis de la Habana* under the command of Lieutenant R. T. Chapman, with instructions to deliver them into the custody of the United States Court and prefer the charge against them "that they belonged to an unrecognized revolutionary government and were pirates upon the high seas." In less than a year from that time Chapman was an officer on the Confederate cruiser *Sumter,* "belonging to an unrecognized revolutionary government and (branded as) a pirate on the high seas."

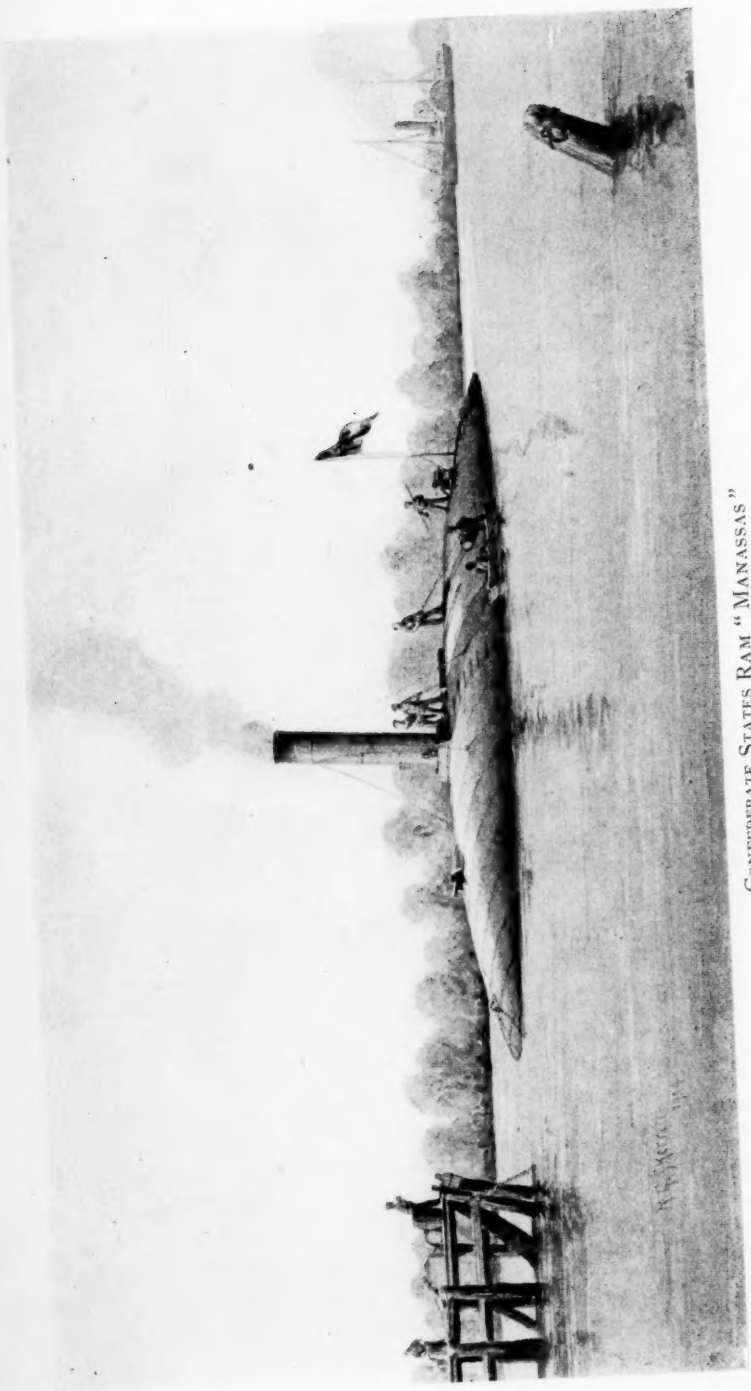
The United States Court decided that the Mexican ships were not lawful prizes, but the decision was made too late to benefit their owners as the outbreak of the Civil War caught them at New

Orleans. The *Marquis de la Habana* was immediately taken possession of by the Confederates who fitted her out as a commerce destroyer. But she never succeeded in getting to sea and finished her exciting career at the bottom of the Mississippi River when Admiral Farragut captured New Orleans.

Besides the *McRae,* with her seven guns, Commodore Hollins' flotilla (?) was composed of three side-wheel tow boats, the *Ivy, Calhoun,* and *Jackson,* and the screw river tug *Tuscarora,* each carrying two 32-pounders.

The commodore was a man of decided character, and he decided that he needed the ram *Manassas* in his business. A polite invitation to her owners that she be allowed to participate in the proposed adventure was contemptuously declined, but a little rebuff like that did not phaze the "old salt" who knew what he wanted, and meant to have it, too. He informed the owners that he would take possession of the ram with or without their consent. They defied him. He had the *McRae,* with her crew at quarters, ranged up alongside the *Manassas* whose crew, composed of some 30 odd men, were standing on the turtleback hurling defiance at the navy men whom they pretended to hold in the greatest contempt. The *McRae* lowered a boat manned by an armed crew of eight men under the command of Lieutenant A. F. Warley (the same who afterwards commanded the ironclad *Albemarle* when Lieutenant Cushing, U. S. N., sunk her with a torpedo). The only other officer in the boat was the writer of this account, who was at the time a midshipman in his 16th year, and very small for his age.

As the boat approached the ram her crew ceased their defiant billingsgate and stood on the turtleback in speechless, as well as helpless, amazement. There was a makeshift Jacob's ladder over the armor, reaching from its apex to the water-line, and, under orders, the small midshipman steered for it. Arriving alongside, Mr. Warley ordered the midshipman to keep the boat's crew in their seats until he called for them, and then, revolver in hand, he lightly tripped up the ladder. The crew of braggarts, who had a few moments before hurled defiance at him, took to their heels and disappeared down a small hole forward which served the purpose of a hatchway. Mr. Warley followed them below and soon they scampered up on deck again through a similar hole aft, some of them being so badly scared that they jumped overboard and swam to shore which, fortunately, was not far away.



CONFEDERATE STATES RAM "MANASSAS"

United States Steamer "Richmond"

It was in this way that the first ironclad built in America became a part of the Confederate Navy.

The large Mississippi River flatboats were also commandeered. The boats, like Noah's Ark, were built without iron nails, their timbers being pinned together by wooden tree-nails. These boats when loaded with seasoned cord wood, pine knots, and barrels of turpentine, made very good fireships. Two very small tugs, the *Mosher* and another called the *Music* furnished the motive power.

This Confederate armada (?), when ready, went down the river to forts Jackson and St. Philip and waited there until near midnight of October 11, when it again started down stream to attack the United States fleet of three sloops-of-war and a gunboat, mounting, in all, some 57 guns.

The night was very dark. The *Manassas* led the flotilla followed by the fireships. The *McRae* (the flagship) came next, and then the *Ivy* and *Tuscarora* in order. The powerful towboat *Jackson* had high-pressure engines and the noise, made by her escape pipes, could be heard for miles, necessitating that she remain far behind if a surprise attack was to be successful. The other tow-gunboat *Calhoun,* whose machinery was very much exposed, kept the *Jackson* company.

At 3.45 a. m. (October 12) a rocket went up from the *Manassas.* That was the agreed upon signal to let the Confederates know she had succeeded in ramming one of the ships of the Federal fleet. Instantly the broadsides of the big sloops-of-war shook the atmosphere and the fireships bursting into flames added to the grandeur of the spectacle.

The *Manassas* had struck the *Richmond* abreast the port fore channels, with the result that three planks of the wooden ship were stove in about two feet below the water-line making a small hole some five inches in circumference. But the ram had done more mischief than this to herself. The *Richmond* had a coal schooner alongside which the pilot of the ram did not see, owing to the darkness of the night. The *Manassas* tore the schooner away from her fastenings and at the same time the latter's hawser shaved off the former's smokestack even with her turtleback, causing the little vessel to soon be filled with her own smoke, compelling her crew to seek air outside. Besides this disaster, the force of the impact, when she struck the solid wooden side of the big *Richmond,* had jarred her engines and boilers out of position and rendered

them useless. In that condition she was carried by the current past the *Richmond* while under a terrific, but harmless fire. The ram lay so low in the water that the projectiles passed over her, and she helplessly drifted into the marsh grass growing on the muddy bank of the river where she was found at daylight by her consorts.

The fireships (?) had also floated harmlessly on to the marsh where they consumed themselves without having done the slightest damage to anything else. The captains of the tugs claimed that they did not have sufficient power to control their heavy tows while going down stream.

While the broadsides of the Federal ships were tearing holes through the air, the *McRae, Ivy,* and *Tuscarora* were being carried by a five-knot current toward them, and had they remained at their anchorage they would certainly have captured the *Manassas,* and most probably the rest of the Confederate flotilla, but fortunately for the latter, while the big guns of the sloops were roaring, they slipped their cables and made for the open sea via the Southwest Pass with the *Preble* leading, followed by the *Vincennes, Richmond,* and *Water Witch* in the order named; the sailing ships with all sail set, and helped by a fresh and favoring breeze. The Confederates followed at a respectful distance.

The *Preble* and *Water Witch,* being of lighter draft, passed over the bar and out into the gulf safely, but the heavier *Richmond* and *Vincennes* grounded, the *Vincennes* with her stern and the *Richmond* with her broadside pointing up stream.

The light-draft and speedy *Ivy,* under the command of Lieutenant Joseph B. Fry, formerly an officer of the U. S. Navy, quickly took advantage of the uncomfortable position in which the *Vincennes* found herself. Running down to within easy range, he commenced to throw shot at her cabin windows (after ports) in which there were two guns that should have been sufficient to destroy the *Ivy,* with her towering walking-beam and huge paddle-boxes making an ideal target, and besides, the *Ivy* could only use her forward gun.

The *McRae,* with the object of diverting the attention of the *Richmond* from the *Ivy,* engaged the heavy sloop at long range, keeping under way, and making circles during the entire action; the little converted tug *Tuscarora* under the command of Lieutenant Beverly Kennon, following the *McRae,* firing her two little guns with great rapidity.

While the action was going on the *Jackson* and *Calhoun* came down the pass and tied up at the pilot station, but neither of them fired a shot.

The action had not lasted two hours when the Confederates were astounded to see the crew of the *Vincennes* abandon their ship, and row over to the *Richmond* and *Water Witch!* Commodore Pope, in his official report of the affair says: ". . . . we returned the fire from our port battery and rifled gun on the poop, our shot, however falling short of the enemy, while their shell burst on all sides of us and several passed directly over the ship. At about 9.30 Commander Handy, of the *Vincennes,* mistaking my signal to the ships outside the bar 'to get underway' for a signal for him 'to abandon his ship' came on board the *Richmond* with all his officers and a large number of the crew, the remainder having gone on board the *Water Witch.* Commander Handy before leaving his ship had placed a lighted slow match at the magazine. Having waited a reasonable time for an explosion, I directed Commander Handy to return to his ship with his crew. . . . ."

Commodore Pope was mistaken about all of his shot "falling short," as many of them passed over the *McRae* and *Tuscarora,* and other projectiles from his ship threw so much spray over the *Ivy* that as soon as the *Vincennes* was abandoned Commodore Hollins signaled the little "tow-gunboat" to withdraw, as the *Vincennes* was under the protection of the guns of the *Richmond* and it would have been useless to attempt to take possession of her, and thus ended the first fight in which an ironclad was ever engaged.

The news of the fight was first proclaimed a great victory by the citizens of New Orleans, but a newspaper admiral soon discovered that Commodore Hollins was much to blame in that he had not towed the whole United States fleet up to the city as prizes of war, the press expert not taking into account the fact that the *Richmond* alone could have whipped the Gulf of Mexico full of just such craft as composed the Confederate flotilla. Unfortunately for the commodore he had laid himself open to ridicule by a telegram he sent to the city, of which the following is a copy:

Fort Jackson, 2 p. m., Oct. 12. Last night I attacked the blockaders with my little fleet. I succeeded, after a very short struggle, in driving them all aground on the Southwest Pass bar, except the *Preble,* which I sunk, I captured a prize (the coal schooner) from them, and after I got them fast on the sand I peppered them well. There were no casualties on our side. It was a complete success.

The *Manassas* having reported that she had rammed one of the warships, and the *Preble* not being in sight at daylight, it was taken for granted that she had been sunk.

The end of the *Manassas* was spectacular, to say the least. When Admiral Farragut passed the forts below New Orleans on the night of the 24th of April, 1862, the ram "ran amuck" through his fleet. She took the broadsides of his heavy ships one after the other and sometimes all together. Among others she rammed the *Brooklyn* and *Mississippi* (Admiral Dewey being the executive officer of the latter vessel), and she also had the temerity to tow a fireship alongside the *Hartford* and succeeded in setting the flagship on fire. Under a hail of shot she burst into flames and shortly afterwards went to the bottom of the "father of waters." The credit for her final destruction being awarded to the *Mississippi.*

It may be of interest to add to this account of "the affair at the head of the passes" that the Lieutenant Joseph B. Fry, who with the *Ivy* so daringly attacked the *Vincennes,* was the same man who was captured by the Spaniards (while he was in command of the blockade runner *Virginius*) and so cruelly done to death at Santiago, Cuba.[1]

[1] See Naval War Records, Vol. 16.

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U. S. NAVAL INSTITUTE, ANNAPOLIS, MD.

WILLIAM CHAUVENET[1]

By Professor W. Woolsey Johnson

William Chauvenet, for whom our club is named, was born on the 24th of May 1820 at Milford, Penn. He was the only child of William Marc Chauvenet, a native of Narbonne, France. William Marc Chauvenet was born in 1790, and was in the service of Napoleon at the time of the latter's downfall, as a consequence of which the former emigrated to Boston, where he married Mary B. Kerr. After failure in business in New York he purchased a farm in Milford where our Chauvenet was born, but in the following year he went to Philadelphia where he again engaged in business.

The chief educational influence in the son's early life appears to have been that of Dr. Samuel Jones, who conducted a school that was regarded as the best boys' school in Philadelphia at that time. Impressed by his pupil's marked ability, Dr. Jones persuaded the elder Chauvenet to have his son, whom he had intended for a business career, fitted for Yale College. Though at the age of 15 the boy had no knowledge of Latin or Greek, he finished his preparation in a year, and entering college in 1836, was graduated in 1840 with high honors in the classics as well as in mathematics.

Of his college course, Professor Coffin, in the Biographic Memoir presented to the National Academy, states that Chauvenet had before admission "mastered the whole course in the mathematical department," and that he was the only member of his class of nearly one hundred who took the optional course offered during his last years in college.

Soon after graduation, Chauvenet became an assistant to Alexander Dallas Bache, who as first president of Gerard College

[1] An address delivered before The Chauvenet Club, U. S. Naval Academy, Annapolis, Maryland.

was engaged in magnetic observations in Philadelphia. In the next year, 1841, Chauvenet's connection with the Navy commenced with his appointment as one of the professors of mathematics, his first duty being as instructor of midshipmen on board the U. S. Steamship *Mississippi*. In those early days, midshipmen commenced their life at sea as mere lads. After five years or more at sea with what little schooling might, perchance, be obtained on board the few ships provided with professors or schoolmasters, the only regular preparation previous to examination for promotion was a course of eight months at one of the three navy yards.

Chauvenet's brief experience convincing him of the uselessness of this desultory instruction at sea, he was about to resign his appointment. But in 1839 the three shore schools had been united at the Naval Asylum in Philadelphia under Professor David McClure. His death occurring in 1842, Chauvenet was appointed to succeed him; thus in the words of Professor Coffin "he was retained in the Navy for the valuable services he subsequently rendered in developing the present Naval Academy from this small beginning."

At the Asylum School, Chauvenet at once set to work to improve the eight months' course, introducing the system of recitations with daily marks as the basis for merit rolls and procuring better apparatus for instruction, particularly in navigation, which was then the principal study. In this he had the sanction of Abel P. Upshur, then Secretary of the Navy, and the warm support of Commodore Biddle, then governor of the Asylum.

Toward the close of 1843, Chauvenet drew up a plan for a two-years course, subsequent to sea service, and preparatory to examination for promotion. This was authorized by Secretary Henshaw. The scheme looked to obtaining other instructors from among the professors then at sea and also such other officers as might be willing to engage in instruction. Of this latter class, Lieutenant J. H. Ward, considered the most studious and accomplished officer in the Navy at the time, was the pioneer. He became instructor in gunnery at the Asylum School, and is listed in the Registers for 1844 and 1845 as on "special duty." (Lieutenant Ward was a member of the original faculty of the school at Annapolis and second in command. In the Register for 1845 his duty is "Naval School.")

The order of Secretary Henshaw establishing the two-years course was revoked by his successor John V. Mason "in deference," says Park Benjamin, "to the representations of naval officers who thought that the midshipmen could not be spared from services at sea to attend a two-years course on shore." It does not appear however that more than a small number of the midshipmen at this time enjoyed even the limited advantages offered by the Asylum School.

It was early in his connection with the Asylum School that Chauvenet was married to Catherine Hemple of Philadelphia. His oldest son, Regis, was born in Philadelphia; two other sons and a daughter were born in Annapolis.

In 1845, George Bancroft became President Polk's first Secretary of the Navy (though in 1846 John V. Mason returned to office). It is said that, before taking office, Bancroft had much at heart the scheme of establishing for the Navy a school which would do for it what West Point had long done for the Army. Accordingly, when Chauvenet went to him with renewed hope for the approval of his plans, he found a sympathetic coadjutor.

Bancroft wisely decided, not only, to take the initial steps without going to Congress, either for legislation or money, but to obtain the cooperation of the Navy, notwithstanding the fact that a group of the older officers assured him that "you could no more educate sailors in a shore college than you could teach ducks to swim in a garret." This element he seems to have outflanked by constituting the Board of Examiners for the promotion of midshipmen which met at the Asylum School in June 1845 as an advisory council, to consider the question of establishing a naval school, the plan of its organization, and its location. The necessity of including this last question was due to the fact that the buildings of the Asylum were now wholly required for its original purpose, and that Bancroft had already obtained the consent of the President and of the War Department to the transfer to the Navy of Fort Severn with the buildings upon the reservation. Thus the selection of Annapolis avoided the necessity of going to Congress for an appropriation.

Commodore Franklin Buchanan was selected by Bancroft for the first commanding officer. Chauvenet and his colleagues at the Asylum School were ordered to Annapolis. For other instructors there were available the professors. At that time

there were 22 of these and three instructors in languages, mostly employed at sea. The most desirable of these were ordered to Annapolis and the rest placed on waiting orders. At that time the professors received $1200 per annum, but this pay ceased when they were placed on waiting orders. Their pay was appropriated for in a lump sum which was at the disposal of the Secretary "for purposes of instruction." Hence by this process not only was the ungracious task of dismissing professors avoided, but the secretary was provided with a small fund for working expenses.

In the school as first organized, Chauvenet's title was Professor of Mathematics and Astronomy. The position of professors was soon after improved as the result of a fracas in the school, amusingly recorded by Professor Henry H. Lockwood, its victim, in a letter read at one of the early meetings of the Graduates Association. They were given commissions and an increase of $400 in their annual salaries when, with other professors at the Observatory, they were constituted a corps in the Navy.

Lieutenant Ward was, in the order of Superintendent Buchanan instituting the Academic Board, appointed by him as its president. But after his return to sea-duty, the next Superintendent—George P. Upshur—in an order convening the Board directed it to choose its own president. Chauvenet was elected to this office. By successive reelections he held this office until the reorganization of the school in 1850.

Chauvenet was the leading spirit in this reorganization which practically constituted the Academy as it is now. The scheme required Congressional action, as it involved a radical change in the method of selecting midshipmen, who between 1845 and 1850 might be appointed at any time and sent to Annapolis for examination for entrance. Objections to this first appear in the records of the Academic Board in 1848 when the Board recommended that Chauvenet and Chaplin Geo. Jones (Head of the Department of English and Secretary of the Board) be sent to Washington to interview the two Naval Committees of Congress. The final report to Superintendent Upshur was made in January 1849 and the resulting bill took effect on July 1, 1850. According to its terms the Superintendent, then C. K. Stribling, became President of the Board "ex-officio," and the Board itself elected Chauvenet as its Secretary.

Chauvenet's list of text-books in his report as Head of the Department of Mathematics at this time may be of interest to members of the Club. It is as follows:

Davies: University Arithmetic.
Davies: Bourdon's Algebra.
Davies: Legendre's Geometry.
Davies: Descriptive Geometry.
Davies: Analytical Geometry.
Chauvenet: Plane and Spherical Trigonometry.
Church: Calculus.
Bowditch: Navigation.

But he adds that it is not expected that evey member will study the whole of each of these books, "the more difficult portions will be given only to the most prepared. Lower sections will not study the Calculus at all and perhaps will not find time for even Analytical Geometry and Descriptive Geometry."

During his connection with the Academy, which lasted till 1859, Chauvenet was twice offered a professorship at his Alma Mater, Yale College; the second time coincidently with his election to the chair of Mathematics at the new Washington University at St. Louis; this last he accepted, becoming later its Chancellor. Coffin says that "he left with regret the field to which he had devoted the best part of his life" but was compelled to do so by regard for the educational welfare of his family. Coffin also states that he was solicited to rejoin the Academy after its return from Newport at the close of the Civil War.

Chauvenet's first publication was a small volume of 92 pages on the "Binomial Theorem and Logarithms for the use of the midshipmen at the Naval School, Philadelphia 1843." This was followed by numerous papers mostly connected with navigation. His treatise on "Plane and Spherical Trigonometry" was published in 1850, and was a great advance on any that had previously appeared in this country, and I think that it is safe to say, in the English language.

But his greatest work is, of course, his "Manual of Practical and Spherical Astronomy" in two large octavo volumes of some 700 pages each. The preparation of this work was mostly made at the Naval Academy, and it is a matter of regret to the Academy's friends that it should not have appeared under its auspices instead of those of Washington University. It has indeed been said that

one of the reasons for Chauvenet's preferring the latter's offer to Yale's was the offer of assistance from friends of the University in guaranteeing the risk of publication of this work. The second volume contains an appendix on the "Method of Least Squares," giving an excellent exposition, following the methods of Gauss's "Theoria Motus."

His final work was a treatise on "Elementary Geometry with an Introduction to Modern Geometry" which was published in 1870, the year of his death.

He had been in poor health since 1864, and had resigned his position as Chancellor in 1869. After vainly seeking relief in change of climate, he died at St. Paul on December 13, 1870.

Considering the amount of work which Chauvenet accomplished, it is surprising to note that he died after a long illness at only 50 years of age. The portrait of him in Benjamin's History of the Naval Academy with its flowing white hair and patriarchal beard gives the impression of a much older man. The medallion recently placed by his family in Mahon Hall represents him, no doubt faithfully, as he appeared in the years of his vigorous work as protagonist in the founding of the United States Naval Academy.

U. S. NAVAL INSTITUTE

SECRETARY'S NOTES

The Institute

The Institute has experienced a very encouraging increase in membership during the past year, but only in the past month has the influx of new members expected as a result of the great expansion of the naval service begun to be felt. The Secretary is in receipt of numerous letters from officers who have recently been addressed on the subject of calling attention of new junior officers of the service to the Institute, the PROCEEDINGS, and the Institute publications. These letters are very encouraging, and the Board of Control appreciates the interest of the authors and the assistance they have given. There seems to have been some misunderstanding as to the right of temporary, reserve and other officers to become regular members of the Institute. A careful reading of the Constitution and of the paragraphs which follow will remove this misunderstanding. The eligibility of *all officers* of the navy to become *regular members* is unqualified.

We submit that hand in hand with the teaching of the technique of the naval profession should go instruction in service ways of thinking, service habits, general naval developments, the progress and lessons of naval warfare, and the diplomatic relations which affect or are affected by the war. Officers responsible for this development and training will find that the stimulation of interest and enthusiasm will be greatly helped by membership in the Naval Institute or by subscription to the PROCEEDINGS.

The Institute presents material which is of general and educational interest to every one in the Naval Service and for that reason alone claims the active support of every officer in the service.

When it is recalled that the net proceeds of the Institute's Book Publication Department are devoted entirely to the maintenance of the quality of the PROCEEDINGS or returned to the entire service in the reduction of prices of books and manuals, it will be understood that "the advancement of professional and scientific knowledge in the Navy" still continues as the primary object of the U. S. Naval Institute. The Institute is a mutual company in which

the profits are divided not only among its 3500 members and subscribers but also among the entire personnel of the Naval Service.

The PROCEEDINGS are published at a loss of about $5000 per year and with the low membership dues it is not expected that the PROCEEDINGS can ever become self-supporting. A great increase of membership can, however, bring the receipts for the PROCEEDINGS to such a point that the expenses will be almost balanced, enabling still greater reductions in the selling prices of the Institute's Publications. An increase of membership means also an improvement in the quality of the PROCEEDINGS because of the wider literary field and greater quantity of material which will be placed at the disposal of the Board of Control.

The Institute claims for its own:

All officers of the Navy and Marine Corps, including those of the Coast Guard, Naval Militia, and Naval Reserve on active duty, as regular members.

All officers of other arms and branches of the U. S. Service and civilians interested in the naval service as associate members.

All enlisted men of the regular service as subscribers, the subscription being the same as dues for members.

Members are earnestly urged to lend an active hand in the expansion of the Institute by doing missionary work among the officers of vessels and stations who are not members and among the enlisted men who, though interested in the work of the Institute, are not subscribers.

Personal responses by officers interested in this matter will be greatly appreciated by the Secretary as it is practically impossible to keep in touch with individual members now that the publication of the monthly Register has been discontinued.

Book Announcements

Attention is invited to the list of publications for a complete list of books revised and republished within the present calendar year. Three changes of price of Institute books will also be noted: Groundwork of Naval Ordnance or Exterior Ballistics has been reduced from $6.25 to $4.50; Range and Ballistic Tables, from $3.15 to $2.75; and the price of A Practical Manual of the Compass has been increased from $1.50 to $1.75.

It is announced that the edition of The Landing Force and Small-Arm Instructions, having become exhausted, a new edition

will not be published, as The Landing Force Manual, U. S. Navy, 1917, is being compiled by a board of officers. It is expected that an authorized edition of Part I (Infantry Drill Regulations) will be ready for issue on November 1. The complete Landing Force Manual will be published in December, and will be ready for distribution about January 1, 1918.

Naval Construction, Robinson, is also undergoing revision and a new edition is announced for October.

Navigation and Compass Deviations, Muir, will be revised and all problems and solutions brought to accord with the new form of the Nautical Almanac. This revision has been undertaken by Mr. G. W. Littlehales and will be published in November.

Suggestions Invited

Comment and suggestions relative to the make-up of the PROCEEDINGS are invited from all members interested in the welfare of the Institute. It is believed that the scope of usefulness of the PROCEEDINGS to members can be increased and all members are invited to assist in this work. Should any topic, on which you think an article could well be written, occur to you, send it to the Secretary and Treasurer, together with such explanation or comment as may appear desirable in order that the intent of the suggestion may be clearly understood. The Institute is desirous of obtaining good "sea yarns" for publication. It is hoped that any one who can spin such a yarn will submit it.

Membership

Since August 18, 1917, 122 regular and 9 associate members have joined the Institute. One regular member transferred to life membership.

Book Department

The Institute Book Department will supply any obtainable book, of any kind, at retail price, postage prepaid. The trouble saved the purchaser through having one source of supply for all books, should be considered. The cost will not be greater and sometimes less than when obtained from dealers. Bills will be rendered upon delivery of books.

Illustrations

Authors of articles submitted are urged to furnish with their manuscript any illustrations they may have in their possession for such articles. The Institute will gladly co-operate in obtaining such illustrations as may be suggested by authors.

Original photographs of objects and events which may be of interest to our readers are also desired, and members who have opportunities to obtain such photographs are requested to secure them for the Institute.

Annual Dues

The annual dues for 1917 became payable on January 1, 1917. It is suggested that dues be paid in lump sums covering a period of two to five years; this method of payment has advantages for members as well as for the Institute and is practiced by a number of members, both regular and associate. Response to this notice will save the Institute a considerable sum in stationery and postage.

In case of death or resignation, dues paid in advance, except for current year, will be returned to estate or individual.

Notice

Whole Nos. 145, 146, 147, 149, 155 and 166 of the PROCEEDINGS (March, 1913, June, 1913, September, 1913, January-February, 1914, January-February, 1915, and November-December, 1916) are exhausted; there are so many calls for single copies of these numbers that the Institute offers to pay for copies thereof returned in good condition at the rate of 25 cents per copy.

Address of Members

All members are urged to keep the Secretary and Treasurer informed of the address to which PROCEEDINGS *are to be sent, and thus insure their receipt.*

This precaution is now of particular importance as notices of changes of station are not now available for the use of the Institute's staff.

Non-receipt of Proceedings

Members and subscribers are urged to notify the Secretary and Treasurer promptly of the non-receipt of PROCEEDINGS, in order that tracers may be started. The issue is completed by the 10th of each month.

Reprints of Articles

The attention of authors of articles is called to the fact that the cost to them of reprints other than the usual number furnished, can be greatly reduced if the reprints are struck off while the article is in press. They are requested to notify the Secretary and Treasurer

of the number of reprints desired when the article is submitted. Twenty copies of reprints are furnished authors free of charge.

ANNAPOLIS, MD., September 18, 1917.

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U. S. S. "H-3" AND THE U. S. S. "Mississippi" IN THE PANAMA CANAL.
The U. S. S. *Mississippi*, which was ordered to Panama to assist the submarine, is also on the above photograph. The U. S. S. "H-3" is the first submarine to pass through the Panama Canal.

PROFESSIONAL NOTES

PREPARED BY

LIEUTENANT COMMANDER I. C. KIDD, U. S. Navy

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NOTE.—Ship construction in the nations at war is held confidential and no reliable information is available.

ARGENTINA

NAVY USED TO CURB STRIKE.—An Associated Press dispatch from Buenos Ayres dated September 6 stated that the government had ordered the destroyer *Corrientes* to reinforce the naval patrol on the river front, thus preventing the strikers from attacking the naval stokers in the electric light and power plant.

CHILE

SUBMARINES.—Convoyed by a force of coast patrol vessels, three Chilean submarines, the *H-3*, *H-4* and *H-6*, left the Boston Navy Yard on Septem-

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U. S. S. "H-3" AND THE U. S. S. "MISSISSIPPI" ON THE DAY WHEN THE SUBMARINE IS ALSO ON THE JOURNEY WITH THE BATTLESHIP. The U. S. S. Mississippi, which would be rescue the submarine, is also on the journey with the battleship, as the background

ber 7, on the first leg of their long voyage to South America. The first stop was at New London, Conn., where the submarines are to have various final tests. The Chilean cruiser *Chacabuco* will act as convoy for the remainder of the journey. Commander Eduardo Schroeder, C. N., is in command of the submarine flotilla, which consists of the submarines originally built by the Fore River Shipbuilding Corporation for Great Britain. They were subsequently turned over to Chile in part payment for the cruiser taken over by the British Government on the outbreak of war. Three other vessels of the same type, the *H-1*, *H-2* and *H-5*, are expected to sail within a week.—*Army and Navy Journal*, 15/9.

CUBA

TRANSFERS SEIZED SHIPS TO THE U. S. GOVERNMENT.—President Menocal signed a decree August 21 transferring to the U. S. Government four large German steamships, the *Bavaria*, the *Olivant*, the *Adelheid* and the *Constantia*, of an aggregate tonnage of approximately 20,000 tons, which were seized as prizes of war on the day Cuba declared war against Germany. The first three named ships are in Havana Harbor. The *Constantia* is at Cienfuegos. The *Kadonia*, the fifth and smallest of the ships seized by the Cuban Government, is retained as a transport for army supplies. The U. S. Government pays nothing for these boats.—*Shipping Illustrated*, 25/8.

FRANCE

CHANGES AT MINISTRY OF MARINE.—The resignation of Admiral Lacaze, who has been at the Ministry of Marine since the Briand Cabinet was formed in October, 1915, is, like the changes at the Admiralty, due to public opinion, which is disturbed at the continuance of submarine warfare. He has been subjected to sustained attacks in the Chamber without any definite reason, except that he has not been able to solve a problem which baffles all the Allied navies. That the French Ministry of Marine may benefit by the infusion of new blood is likely enough, but whether it will be in the precise direction that the adverse critics of Admiral Lacaze desire depends less upon the merits of his successor than upon events. Invention may prove equal to providing an answer to the submarine, but then again it may not. As in England and the United States, so in France, the navy will have to deal with the menace as it has been doing, whoever is the head of the Ministry of Marine. It is, however, possible that there will be new developments, due to the declining value of the German submarines now on the water and to the evolution of naval opinion in all the Allied countries under the pressure of new conditions at sea. But neither has anything to do with the changes at the British Admiralty or in the French Ministry of Marine.—*The Army and Navy Gazette*, 18/8.

TO TRIPLE TONNAGE OUTPUT.—France expects to construct three times as many vessels for the merchant marine in 1918 as in normal times before the war, according to official announcement.

"A minute survey of the situation has just been completed by Anatole de Monzie, Under Secretary of Merchant Marine," says the announcement, "which he conducted for the purpose of establishing precisely what supplies of metals and materials are available; what quays, docks and slips can be counted upon and what labor is at hand. His investigations convinced him that he can triple the peace time tonnage, and he has completed a program accordingly—a program which allows for added dock building also, so that the ultimate tonnage can be increased to an even greater extent than was projected for 1918. The Ministry of War has agreed to turn over to the Merchant Marine Department several quays in one of its arsenals to facilitate the work."—*N. Y. Herald*, 5/9.

GERMANY

"DEUTSCHLAND."—The German commercial submarine *Deutschland*, which visited the United States before that country entered the war, has been converted into a war submarine, according to German fleet gossip reaching the Associated Press. The *Deutschland* has been fitted with six torpedo tubes.

The submarine, it is said, may soon leave for the Pacific to operate against traffic from San Francisco. The U-boat was to have started activities some time ago, but an explosion on board while the vessel was on a trial trip made necessary repairs which took considerable time.—*N. Y. Times*, 15/8.

HIGH SEA FLEET.—The German fleet, according to an informant of the Associated Press who recently had been at Wilhelmshaven, justifies its name of high sea fleet by running out from Wilhelmshaven with considerable regularity, sometimes two or three times a week. The fleet only makes short trips, however, and never goes very far out to sea.

The high sea fleet usually leaves Wilhelmshaven in the evening and is back by early dinner time between 11 o'clock and noon on the following day. On a few occasions it has remained out longer, but only because thick weather set in, making a passage through the German mine fields dangerous and forcing it to remain in the shelter of Heligoland until the weather cleared.

A greater part of the time the battleships and cruisers comprising the battle fleet are anchored in security behind mine fields and nets and a triple line of pickets protecting the entrance to the base. Once in March the fleet had a considerable period of enforced repose, when British mine layers, taking advantage of thick weather, sowed the coastal waters so full of mines that the German vessels were unable to leave the harbor.

The enlisted personnel of the fleet knew nothing of American preparations for active participation in the war. The men were told by their officers that America's declaration of war on Germany was only issued as a cover to preparations against Japan and that American troops would not be used in Europe.

The German losses in submarines, according to the informant, have been 20 to 22 boats, this figure apparently covering the losses since the start of the unrestricted submarine warfare campaign. Four additional boats are said to have been lost in the Mediterranean.

Germany now has almost 300 submarines, the newest boats being of the big seagoing type and armed with a 6-inch gun. This armament appeared on boats commissioned in the middle of June, the earlier boats of this latest, or D. E. E. type, and the preceding C. E. E. type being armed with a pair of 105 millimeter guns, approximately 4-inch guns, fore and aft.

The 300 submarines, however, include a large number of the so-called canal boat type, built for passage through the Belgian canals to Zeebrugge, and which are of inferior armament and a smaller radius of action.—*N. Y. Times*, 15/8.

NEW CONSTRUCTION.—A large cruiser launched at Danzig, August 15, according to a Berlin dispatch, was christened *Count von Spee*. Prince Henry, of Prussia, brother of the Emperor, made the address. The warship was christened by Countess von Spee, widow of the late admiral.

Admiral Count Maximilian von Spee was the commander of the German squadron in Pacific waters at the outbreak of the war. On November 5, 1914, he was victorious in a naval engagement with a British squadron off Coronel, Chile. The admiral was lost when his squadron was destroyed by a British fleet off the Falkland Islands, on December 8, 1914.—*N. Y. Herald*, 16/8.

MAN POWER.—The Associated Press is able to give approximately the figures representing the man power of Germany in the war at the present time, together with the casualties, as follows:

Fixed formations on the various fronts, employed on lines of communication and stationed in the interior, 5,500,000.

Divisions undergoing formation and men in depots, 600,000.

Losses in killed, permanently disabled and prisoners, 4,000,000; wounded under treatment in hospitals, 500,000. Total, 10,600,000.

These figures account for all the men called out up to the present for service as follows:

Trained men mobilized immediately on the outbreak of the war, 4,500,000.

Untrained ersatz (compensatory) reservists called out, August, 1914, to February, 1915, 800,000.

Class of 1914 recruits called out November, 1914, to January, 1915, 450,000.

First *ban* of untrained Landstrum called out at the beginning of 1915, 1,100,000.

Class 1915 called out May-July, 1915, 450,000.

Remainder of untrained Landsturm called out the same month, 150,000.

Class of 1916, called out September-November, 1915, 450,000.

Contingent of hitherto exempted men called out in October, 1915, 300,000.

Second contingent exempted men called out early in 1916, 200,000.

Second *ban* Landstrum early in 1916, 450,000.

Class of 1917, called out March-November, 1916, 450,000.

Third contingent exempted men late in 1916, 300,000.

Class of 1918, called out November, 1916, to March, 1917, 450,000.

Class of 1919, called out in part in 1917, 300,000.

Additional exempted men, 1917, 150,000.

Total, 11,500,000.

The discrepancy in the figures is accounted for by the omission of the mail units. The total mobilizable male resources of Germany since the beginning of hostilities, including the yearly classes of recruits up to 1920, number about 14,000,000. Those called up number 10,600,000. The remainder are accounted for as follows:

The remaining part of the class 1919 awaiting call, 150,000; class of 1920 still uncalled, 450,000; men employed as indispensable in industries and administrations, 500,000; men abroad unable to reach Germany, 200,000; men entirely exempted owing to physical disability, 2,100,000.

Recruits of the 1920 class cannot be called legally until they attain their seventeenth birthday.—*N. Y. Times*, 11/9.

SUBSIDIES FOR SHIPBUILDING.—The following particulars relative to proposed grants by the German Government for the reestablishment of the German mercantile marine have been collated from information appearing in the press of that country July 11 and 12.

The promised bill for this purpose has been submitted to the Reichstag and referred to the Committee for Commerce and Industry. The usual official commentary states that of the 5,000,000 tons gross register of merchant shipping possessed by Germany before the war, over 2,000,000 tons have fallen into the hands of the enemy or been put in danger by the war, and, in consequence of the blockade, over 1,000,000 tons are lying inactive in the ports of Germany's allies or in neutral ports. On the other hand, neutral and, to some extent, enemy shipowners have made the greatest efforts, supported by their governments, to increase their fleets, the United States and Japan in particular having greatly extended both their shipbuilding and their shipping connections.

The bill is confined to two objects—(1) the making of grants to shipowners for the replacement of lost tonnage by building or purchase from abroad, and (2) the making of grants to ships' crews for the replacement of their lost property. Grants so made are not to be repayable, but are to be reckoned towards any compensation which shipowners and crews

may receive under the projected shipping compensation law. So far as the grants to shipowners are concerned each grant is to be *prima facie* only up to the amount of the peace value of the ship (as on July 31, 1914); but, to allow for the rise in prices, additional sums may be granted, varying according to the date at which the new ship is put in service. These additions may be 60 to 80 per cent of the peace value if the ship is put in service within three years, 40 to 60 per cent if it is put in service in the third to sixth year, and 20 to 40 per cent if put in service in the seventh to ninth year after the conclusion of peace.

An important condition imposed on the owners is that a ship, towards the procuring of which a grant has been made, may not be sold to any foreigner for 10 years after the commencement of its service, except by permission of the Imperial Chancellor, and a similar permission is required for all charter-parties and affreightment contracts for the whole or part of the ship. The Chancellor may make such permission dependent upon the repayment of the grant.—*Shipping Illustrated*, 25/8.

GREAT BRITAIN

THE GRAND FLEET.—When the grim, grey forms of the King's grand fleet loom up before us in these northern latitudes they convey to us a sense of power that no one can dispute. Line upon line, in ordered majesty, great ships and small, they stretch away farther than the eye can reach, and as the vastness of the mighty armament becomes clear to us, the terrible character of this tremendous instrument of war leaves beholders dumb.

Inevitably we recall the immortal passage in which Mahan wrote of the ships upon which Napoleon's grand army never looked, the ships that stood between him and the empire of the world, and without any strain of meaning we apply the passage to our present case. Between the Kaiser's hordes and victory there stands the British Navy, which has impeached many a foe from fooling us, and by its constant, wearing, and yet invisible pressure makes war a weariness to the stoutest foe.

The question had arisen in my mind whether all was well with the navy after three years of war, how men and material had fared, whether all that was needed for success had been provided, whether the naval strategy adopted had the approval of our best fighting seamen, and whether anything remained to be done to enable this great instrument of naval battle to defeat more surely and more speedily the designs of the enemy. Misled as we often are and must be in war by the pretences and half-truths of officialdom, we landsmen have only one means open to us to ascertain the truth—namely, to go seek it from those who know, to judge matters on the spot for ourselves, and to discard all hearsay evidence, which, in this great war, is the mother of lies.

Well, I have been to see. I have talked over these matters with those best informed. I have visited the types of ships, great and small, which interest me the most, and though I am well aware that the opinion of a landsman on naval matters is exceedingly unimportant, still the landsman is not prevented by "Dora" from forming an opinion, or even from expressing it with due discretion. My opinion is, taking everything together, that the war efficiency of the grand fleet is 100 per cent higher than at the time of the declaration of war, and 50 per cent higher than when Jutland was fought.

The material of the grand fleet appears to be in first-rate order. Sir David Beatty's flagship is as clean as a row of new pins and looks as though she had come straight out of a Portsmouth band-box. If ships that burn oil are necessarily cleaner and more spick-and-span than those that burn coal, there is no difference in essential matters, and from the mechanism of the turrets of the great guns to the smallest detail on the newest submarine there is a facility of manipulation and a perfection of

control that rejoice the heart of a visitor. We expect naturally to see signs of wear and tear in naval material after three years of war, but we seek for them in vain. If credit is primarily due to the officers, petty officers, and seamen of the grand fleet for this fact, we do not forget the dockyards and their workers, to whose unceasing vigilance and labor is due the rapid repair of all defects, whether arising from the action of the enemy or otherwise. A First Lord told me some months ago that 20,000 units of the navy had been in dockyards' hands for repairs since the beginning of the war, and it is largely to the regular overhaul of the ships that the efficiency of the fleet material must be attributed. There are no worn and crazy ships such as admirals in the past have had to handle. The grand fleet is still as good as new. It is even better than when it was new, and much better too.

The navy had an uncommonly rough time during the first months of war, almost as rough a time in its way as had the army in France. Inadequate comprehension of and preparation for war in the higher spheres of governments and departments are dearly paid for by the services when war breaks out, and our navy was not exempt from faults and consequent losses. But the navy, and all those who slave for it, have worked hard, and most of the defects shown up by war experience have now been made good. Not all, indeed; but so far as the grand fleet itself is concerned all the main deficiencies have been remedied and constructional defects have been made good without interfering with the activities of the fleet.

What is true of matériel is true of men. I expected to find crews showing signs of strain from this never-ending war, but I cannot say that I found any symptoms of strain at all. The health of the navy is superb. In these northern waters the causes of sickness are exceedingly remote, and there is always enough work to be done to keep the mind occupied and the body fit. If the crews are not quite the hard, bronzed specimens of humanity which pour out of the leave trains from France, they are all the same exceedingly fit, and all appear contented and in excellent good humor. When Beatty strokes a winning boat in a regatta, a shout goes up that would waken the dead.

I write of the grand fleet, and not of the squadrons, patrols, and flotillas, the mine-sweepers, and other special craft, which carry on the minor operations of the war. We all know to our cost that the ships and the plant necessary for waging successfully the minor forms of war were, and are still, most inadequate for our purpose. Great has been the task of those who with inadequate means have endeavored to carry out their mission, and heavy is the responsibility of those in London whose want of foresight has been the primary reason for the losses which our maritime trade has suffered. But it has been want of foresight, and not congenital inability to find the antidote for the bane, that has hampered us, and with our immense resources, joined to those of our allies, we shall in time wear the enemy down—even under the sea. Meanwhile his expectation that want of food and of raw material would compel us to make peace has been shown by experience to be completely fallacious.

To give the devil his due, the German enemy is a fine instructor in the art of war, and from the first moment that our navy discovered that it did not know everything it acted, like our army, upon the maxim *fas est et ab hoste doceri*. In the air, on the water, and under it, progress has been as continuous as marked. Germany no longer possesses certain advantages at sea that she once could boast. She may have others up her sleeve, but so may we. The art of naval warfare is essentially progressive, and even when the grand fleet lies silently at an anchorage there is an immense amount of work in progress on all sides. I think, even from what I have seen, that our navy is now an incomparably superior instrument in battle, and if fortune favors us with another fleet action no one can have any doubt of the result.

But no needless risks must be run with the grand fleet. Although the Allies are immensely superior to the Central Powers in aggregate naval strength, the number of British battleship units is not so superior to the German number that we can afford to indulge in any spectacular follies. I have never had any doubt that the grand lines of our naval strategy were correct, and I am fortified in this belief by my visit to the grand fleet. We have not set the bells ringing so often as we could have wished, but the navy has successfully accomplished its main mission. It has driven the enemy's flag and trade from all the seas and oceans of the world, has been our sure shield at home, has escorted our armies across the waters to their various destinations, and remains almost intact and sensibly superior to the enemy. This is a favorable result from our first great war since the introduction of steam and the application to the navy of all the vast machinery, offensive and defensive, of modern science. We must not ignore this result, nor belittle it because the classic naval victory is still denied to us.

It takes two to make a quarrel, and the German high sea fleet, since Jutland, has not found conditions favorable for engaging. Certainly the enemy may yet fight, and our grand fleet is commanded in the expectation that he will do so. No other expectation is legitimate to entertain. The enemy, if he comes, will come with his whole force, submarines included, and some units of ours will, at such a moment, be normally under repair. Therefore the grand fleet has to be ready to tackle him, and to make humanly sure of victory, under the conditions specified, and further to be ready to steam out and fight at any moment of any day or night that the enemy may select. This is an advantage of which the enemy cannot at present be deprived, but it is nothing new in naval annals. If we did not ask Nelson or Collingwood to adopt offensive tactics during their long vigils off Toulon and Brest, why should we ask Jellicoe or Beatty to alter the practice? The old admirals took up the best offensive position for engaging if the enemy wished to fight, and our admirals to-day, Tyrwhitt included, are following their example. But let us be clear that our position is offensive and that our navy defends by attacking. The enemy sneers because our practice is highly inconvenient to him, but this is no reason why we should change it. An enemy's criticism in war is only made to mislead.

I find that the confidence of our naval chiefs in their men, and of the men in their chiefs, is everything that could be wished, and that the spirit of the grand fleet is altogether admirable. The practice of consulting the commander of the grand fleet in the appointment of flag officers and captains is one which is followed in the army, and is wholly to be commended. The youth of our navy is a thing to admire, but youth does not prevent prudence from having her part in the supreme command. It is good that the new First Lord should already have visited the grand fleet and should have taken stock. He has left behind him the impression that the fighting navy will be able to work with him, and first impressions, when they are satisfactory, are advantageous. At the same time, I must in bare justice register the fact that the departure of Sir Edward Carson from the Admiralty is much regretted. His constant visits to the grand fleet, his deep sympathy for the navy, and the many useful changes which he unostentatiously introduced during his too short term of office, have endeared him to the senior service, which is only partly consoled by the knowledge that his presence on the War Cabinet will be of service to the cause.

On two points only I venture a very brief criticism. I do not find that the grand fleet is in sufficiently close relations with the army, and particularly with the commander-in-chief of the home defence land forces. I find also that, as in the army, for one anxiety inspired by the enemy, there are nine inspired by London. It is inexpedient to say more, except that by the common consent of all naval officers and others with whom

I have spoken the grand fleet is all right, and that it is at the seat of government that defects have to be remedied rather than at the fronts by land and sea.

David Beatty and Colin Keppel were two comrades of the army in the Sudan, and very highly we valued them. It is the same David Beatty that I met on the quarter-deck of his flagship, the same robust and active figure instinct with vitality and go, the same quick glance and resolute expression, the face a little more lined and seamed with thought it may be, but still young and strong, and the cap with its unconventional peak still tilted at impossible angles, first one way and then another. The little frail gunboat of Nile days has been replaced by this majestic fleet which he now commands, but we remember how well he and Keppel fought and handled their little craft on a falling and a rising Nile, and how Beatty at the Atbara helped up with his rocket battery and then went in with the first ardent spirits at the head of the stormers. A table-man? God forbid! The navy may need a good table-man at Whitehall, and a Barham for choice, but David Beatty is a fighting admiral who possesses the entire confidence of the fighting navy, and politicians who would drag him to London should be hanged.—*The Times* (London), 15/8.

MIDSHIPMEN.—The British Admiralty has at last relieved parents of midshipmen on active service from the obligation to contribute to their support for the duration of the war. This applies also to acting sub-lieutenants and assistant clerks. The allowance is £50 a year in the first case and £20 in the others.—*Shipping Illustrated*, 25/8.

BETTER AIR SERVICE DEMANDED.—Renewed newspaper attempts to stir the British Government to greater air activity have followed the air raid of August 23 on the southeast coast of England. There also may be more demands for reprisals against the Germans since the bombing of pleasure resorts like Margate and Southend, which have no military or industrial establishments, aroused indignation even greater than was caused by the attacks on London.

The gist of the complaints is that although the fourth year of the war is beginning, the British Government has not awakened as much as has Germany to the importance of aerial warfare, nor kept abreast of the German designers in improved and powerful types of machines.

The *Pall Mall Gazette* says the British airmen are fighting superbly, but it notes with anxiety that their success seems to be achieved at a steadily growing cost, and that German airmen are fighting better than formerly and are showing an improvement in morale in every respect. The newspaper concludes:

"Unless there is speedily an official awakening to the reality of the position our future may be jeopardized."

One of the chief handicaps to the air service, according to most experts, is that it remains under a dual management, being a subordinate department of both the army and the navy. Even the defences of England are under the divided control of these two services, and some critics allege the co-operation is not what it might be.

The town council of Southend has petitioned the government for reprisals, and asks it "to give an assurance that the engineering of the scheme of reprisals will leave little doubt that the German civilians shall suffer to as great an extent as the civilians in England have suffered."

The *Manchester Guardian* expresses great dissatisfaction over what it terms British weakness in the air, and says that Great Britain's position should be such that an invasion of the United Kingdom by air would be as impossible as on the surface or by water.

"The air service," the newspaper continues, "comes into conflict with two great vested interests, that of the army and of the navy, who are both concerned to push their own solutions of our military difficulties, and

regard the newcomer—air power—with a certain degree of jealousy. It must be put at the service of the nation and above any mere detrimental subordinations.

"Until the Air Ministry becomes a separate department of state, equal to the War Office and the Admiralty, we shall never realize all the value that is to be got out of it."

The newspaper concludes that if the Germans take the lead in the air Great Britain will be less well off than she was a year ago.—*N. Y. Times*, 24/8.

NAVAL HOSPITAL SERVICE.—Dr. James Porter and Dr. A. Vavasour Elder have written an account of the method used for the transportation of the sick and wounded of the British Navy for the *British Medical Journal*. They say that the removal of these men from the scenes of their activities to the seclusion of a hospital is no small factor in the general work of the Medical Department.

This paraphrase of their account appears in the *Medical Record:*

"To deal with this phase of medical work a special medical transport organization has been created. There is a central office at the Admiralty for the principal medical transport officer, who is thus in touch with the department. Medical transport officers have been appointed at all places around the coast where wounded are likely to be landed after action. At each of these places provision has been made for establishing dressing stations and temporary hospital accommodation for a certain number of cases until such time as an ambulance train can be sent to remove them to base hospitals elsewhere.

"One of the difficulties is the impossibility of arranging in advance or foretelling exactly at which spot and in what numbers wounded will be landed. Certain obvious bases exist to which ships return after an action, but at the same time these bases are far apart, leaving large gaps of coast line with many ports into anyone of which rescue vessels and smaller damaged vessels might be compelled to enter and discharge their wounded. Hence the establishment of what are termed emergency medical depots, with medical transport officers in charge of each at various places along the coast. Thus a sudden inrush of wounded men can be taken care of.

"Briefly, from the time a wounded man is landed from a ship until he is finally placed in a hospital he is in the charge of the land medical transport branch of the Naval Medical Service. The system adopted by the navy differs from others in so far that when a man is wounded severely enough to require immediate treatment in bed, after having received medical attention, he is put to bed in his ship in a standard medical cot and made as comfortable as circumstances will permit.

"The cots are canvas, stretched over a wooden frame and laced together, and so made that the sides can lap over the wounded man, affording extra protection and warmth. Each cot is provided with sufficient bedding, including a mattress, thus making a complete bed wherever situated. These cots are 'slung' to a standard and are removable, so that from the time a patient is placed in a cot on board a fighting ship until he is finally put to bed in a hospital he is never moved out of it. He and his cot travel together all the way, thus saving much of the pain and suffering involved by frequent transfers by stretchers and trains.

"Ambulance trains, motor ambulances, bearer parties, etc., have been specially organized in a standard and uniform manner, with regard to each individual link of the transport chain. As regards the ambulances, beyond being fitted specially to take naval cots instead of the military stretcher, they are simply a squadron of 30 motor buses, which were taken over from the London General Omnibus Company early in the war, and were fitted with spring trestles, on which the cots rest. The writers state that these have proved exceedingly satisfactory in every way, being just as comfortable for patients as the latest pattern specially built ambulances.

"Each emergency medical depot along the coast is supplied with cot, clothing, hospital, and medical units, respectively. The cot unit consists of completely equipped service cots, which can be used to form the nucleus of a temporary hospital in suitable local buildings, selected in advance for this purpose. The hospital and medical units contain all the necessaries their names indicate. The clothing unit is for use of men suffering from immersion and lack of clothing.

"In addition to preparedness for 'The Day,' the Medical Transport Department takes care of the ordinary sick from the fleet at the various ports. Ambulance trains take the sick and wounded each to his home port, and in close touch with friends and relatives. No stops are made except for gas and water, or railway requirements as they arise. Each patient's dietary is carried out en route. A full-sized naval ambulance train carries 136 cots, and a smaller-sized train 40 cots and 36 sitting cases. All the trains are self-contained, and, when in motion, self-supporting, carrying everything in the way of provisions, stores, etc.

"The staff consists of two medical officers and 36 men, including cooks, clerks, and others, who live in the train continuously. The trains are commissioned like ships, sea watches being kept day and night. For ordinary routine journeys nursing sisters are not carried, but a cabin is set apart for two in each train for use when required, as after a naval engagement, or when any cases calling for their presence are being transported. The nursing itself is done, as in the navy afloat, by trained male sick berth ratings.

"Porter and Elder tell of one of the interesting features known as the 'Day Coach.' These coaches are fitted with flap tables and the non-cot cases can sit at them. Under these tables is a row of wash basins connected with the water supply. At one end of each of these coaches are two padded rooms fitted up for the more violent mental cases. A small dressing station supplied with instruments and drugs is also aboard. Very little is done in the way of dressings except while the train is at rest. For the same reason no operating theater has been arranged, on the assumption that a case in need of an operation would not be traveling. If such a case were encountered operative measures would be carried out at the cot side, or the patient would be landed at the first opportunity.

"A portable electric signaling device is fitted at each end of the train and coupled up with the engine, so that speed, heating, and other matters can be controlled. The trains are lighted by electricity—dynamo while running and accumulator when at rest. Electric fans are fitted where requisite, and portable lights are arranged for in all the ward coaches. Gas is used for cooking only, and is carried under the kitchen cars and one car adjoining, the cylinders being coupled together, thus the danger of fire is reduced to a minimum. Heating of the coaches is by steam from the engine, carried in overhead pipes suspended from the roof."—*N. Y. Times*, 21/8.

SHIPPING SITUATION.—There is no need for anxiety regarding British shipping, so far as the submarine campaign goes. When the present situation of our mercantile fleet is considered in all its bearings, it is found that the shortage in tonnage is due not so much to the war wastage as to the unavoidable absorption of tonnage for war purposes. The fleet of the United Kingdom prior to the war totaled between 17,000,000 and 18,000,000 tons; to-day it is a little over 15,000,000 tons, notwithstanding the fact that mercantile shipbuilding output for all the three years of the war was little more than one-third of the pre-war output. Indeed, had it been possible to maintain the former rate of production there would actually have been an increase. This augurs well for the future, when it will be possible to increase the amount of material and labor available for mercantile shipbuilding. And in this connection it is satisfactory that the first

of the fleet of the standard ships of 8000 tons deadweight capacity will be ready this month, and the others will follow in rapid succession.

The real difficulty is that about 6,500,000 tons of the total fleet has been absorbed to meet the needs of the British navy and army, our allies, and the British dominions across the sea. One million more tons of our shipping engaged on certain work cannot carry peace exports, as war material fills the holds, but it is available for imports. Thus it may be said that so far as exports are concerned less than half the fleet is available for commerce. The tonnage required for war service may seem high, but this is easily explained when consideration is given to the number of auxiliary cruisers, of hospital ships, of coal and oil carriers, and of transports required for war work. In the first two and a quarter years of the war, for instance, 8,000,000 men had to be transported across the seas, 9,420,000 tons of supplies and explosives, 1,000,000 horses and mules, and of petrol alone 47,500,000 gallons, while of sick and wounded men over 1,000,000 were carried.

It has been felt, however, that owing to the relatively small proportion available for trade, some system of co-ordination is essential in order to secure the maximum efficiency from the available ships, and to ensure the employment of every vessel in the manner and on the terms, as to rate of freight, most consistent with the national interests. The government have therefore now taken complete control of all merchant shipping, and the result is thus semi-officially stated: With the exception of a few vessels engaged in distant waters on work which is vital to British colonies and of vessels chartered to France and Italy, the British Government has requisitioned for hire at government rates about 97 per cent of the ocean-going tramps on the United Kingdom register. All British liners have been requisitioned and are being run for government account. The owners receive hire at government rates and the profits derived from private freight carried at market rates go to the government and not to the shipowner. Every ocean-going voyage of British steamers is now directed by the government, who have regard only to the question of how they can obtain essential imports from the nearest source, and disregard both the interests of the shipowner and the exporter. Many trades built up in distant waters and sustained by British industry have had to be abandoned to neutral owners, who gladly seek employment for their vessels in areas immune from war risk. The coastal traffic round the shores of the United Kingdom is being subjected to a searching review for the purpose of withdrawing vessels which can be utilized for ocean-going work, and of bringing about a limitation of rates wherever possible.

The owners are patriotically co-operating in this movement, and their organizations are to be pooled, while their staffs and resources are placed at the disposal of the government for running the requisitioned ships. This in itself involves a sacrifice, as in many instances the trades built up by the shipowners must suffer severely from the depletion of shipping available for such routes, owing to the diversion of the steamers for other trades where it is possible to attain higher efficiency, as measured by the tonnage of imports per unit of time occupied. This, however, is only a small part of the disinterested action of the shipping community, and we must never for a moment forget the risks run by officers and crew in connection with the navigation of ships through dangerous waters, and, we may also add, the success obtained in combating enemy submarine boats. The owners of ships, too, have also shown in most cases a disinterested acquiescence in limitations imposed. Liners have been diverted from long-voyage routes, particularly in the case of India and the Far East, to short-distance trades, while a great volume of profitable trade between foreign countries, in which from 2,000,000 to 3,000,000 tons was formerly engaged, has had to be handed over to the ships of neutral countries. The owners of coasting ships, too, have suffered by the restriction of trade around the coast, particularly in respect of coal-carrying.

Already considerable advantage has been gained by the limitation of exports and imports. Before the war we were importing at the rate of about 58,000,000 tons per annum, but last year the imports fell to 43,000,000 tons, and this year they will be considerably less. Of the 58,000,000 tons rather less than a quarter was foodstuffs; the remainder was raw and other material for peace requirements. Last year, however, two-thirds of our supplies were foodstuffs, munitions of war, and material for the manufacture of munitions, leaving only about 14,000,000 tons for productive industries, as compared with upwards of 40,000,000 tons in pre-war times. In the present year it would seem that we are likely to get even less than the 14,000,000 tons for productive industries. The total imports in 1913 were valued at 769,000,000*l.* sterling, of which about 94,000,000*l.* came from the countries which are now enemies. In 1916 our imports were valued at 949,000,000*l.* sterling, none of which came from enemy countries. The rise in price accounts for a large part of the phenomenon of an increase in value with a decline in bulk from 58,000,000 to 43,000,000 tons; on the basis of pre-war prices the cost would have been about 800,000,000*l.* sterling. This is due to the different class of commodity being imported, a far higher price being paid for the unproductive material of war which circumstances have compelled us to substitute for the imports of peace time.

The value of our exports of produce and manufactures in the year prior to the war was 525,000,000*l.* sterling, while last year they were valued at 506,000,000*l.* sterling; but if the prices had remained the same as in 1913 the total would only have been 386,000,000*l.* sterling. The export trade has therefore been reduced by about 26 per cent, 10 per cent having been exports to our present enemies, and the remainder to other parts of the British dominions, to our allies, and to other foreign countries. Our exports to allies have increased to some extent, but this affords no substitute for the loss of permanent trade. Our exports to other foreign countries and to the dominions overseas have fallen off in value by about 100,000,000*l.* sterling, representing on pre-war values 337,000,000*l.* sterling—nearly one-third of the total.—*Engineering*, 10/8.

WORLD'S LARGEST DRY DOCK.—It is now fully expected that the mammoth graving dock which is being built for the Canadian Government at Levis, Quebec, will be ready for service very soon. With a length of 1150 feet, a width of 120 feet, and a depth of 45 feet, it will be the biggest structure of the kind in the world. Docks of similar size have been planned for the Dominion authorities at St. John, N. B., Halifax, N. S., and at Vancouver, B. C. Canada will therefore be fully equipped for docking the largest vessels that are likely to be built for years to come.—*International Marine Engineering*, September.

LIVES LOST ON MERCHANT VESSELS.—It is officially stated that the number of lives reported as lost on British merchant vessels owing to enemy action from the beginning of the war until June 30, last, is 9748—namely, 3828 passengers and 5920 officers and seamen.—*Army and Navy Gazette*, 18/8.

JAPAN

SHIP CONSTRUCTION.—Advices from Japan say that a big order has just been received by the Kawasaki Dockyard Co. of Kobe from Great Britain. The total value of ships ordered amounts to more than 50,000,000 yen. The present order from Great Britain consists of 14 freighters, the tonnage of which ranges between 9000 tons and 12,000 tons. The total value of those ships will be about 50,000,000 yen. The British buyer will pay 40,000,000 yen in cash and 10,000,000 yen in either British or Japanese securities, while his yard will deliver those ships one after another on their completion. Mr. Kawasaki will select a site for a branch yard at Kokura.—*Shipping Illustrated*, 1/9.

SHIPPING.—The prosperity in the Japanese shipping trade continues at high-water mark. Owners are rapidly disposing of their ships at phenomenal prices, on the principle of making hay while the sun shines. One steamship company recently sold all its vessels and other property, and deducting from the proceeds of the sale all the liabilities, was able to pay the shareholders 1000 yen for each 5 yen paid-up share. A similar course has been taken by other companies. It is stated that one of Kobe's new shipping millionaires recently sold off the few ships in his possession and realized nearly 10,000,000 yen, though he paid less than half that amount when he bought them. There is, however, another side to the picture, as was lately pointed out by the Japanese Minister of Communications, who, in a recent speech, urged Japanese shipowners to stop selling their vessels to foreigners. He pointed out that at the conclusion of peace Japan would require every ship she had or could get to be in a position to maintain the great increase of trade the war had brought her, and also further to develop her foreign trade. He expressed the opinion that, for some time after the war, there would be no falling off in the demand for ships, nor in the profits to be obtained. Japanese should, therefore, "love their ships," so that with a vast mercantile marine the country might be in a position to reap every advantage from the demand for tonnage. Despite this warning, Japanese owners seem still inclined to sell their ships at top prices and invest the capital elsewhere.—*Shipping Illustrated*, 1/9.

NORWAY

NORWEGIAN SHIPPING.—During the first half of the present year the Norwegian merchant navy has been increased by 29 vessels, built within the country, and having an aggregate tonnage of 20,000 tons; whilst some 20 vessels, of an aggregate tonnage of 58,000 tons, have been built abroad—11 of these have been built in the United States, 7 in Holland, 1 in Japan, and 1 in Denmark. During the same period 18 old vessels, of an aggregate of about 10,000 tons, mostly sailing vessels having motor power, have been bought abroad. The decrease during the first six months has been very serious, amounting in the aggregate to 276 vessels with an aggregate tonnage of 418,000 tons, of which total only 29 vessels with an aggregate tonnage of 31,700, have been lost through ordinary mishaps, the rest having been torpedoed or lost through collision with mines. The mercantile navy of Bergen has, during the last 10 years, increased from 326 vessels with an aggregate tonnage of 385,245 tons to 439 vessels with an aggregate tonnage of 567,655 tons. The net earnings of the Bergen fleet of tramp steamers, excluding those of the Bergen Steamer Company, amounted for 1916 to 104,000,000 kroner, against 47,700,000 kroner for 1915, 10,000,000 kroner for 1914, 12,400,000 kroner for 1912 and 7,200,000 kroner for 1911. (1 kroner = about 1*s.* 2*d.*)—*Engineering*, 17/8.

PERU

PROTESTS.—The Peruvian Minister in London has received the following cablegram from his government with reference to the sinking of the Peruvian ship *Lorton* by a German submarine:

"The German Government having decided to submit the *Lorton's* case to a prize court, we have instructed the Peruvian Minister at Berlin to inform them that, according to the Declaration of London, alleged by Germany, the sinking of the *Lorton* is absolutely unjustified, considering the ship's nationality, the sort of goods it carried and their destination, the place where the ship was sunk, the impossibility for the ship to know the decree concerning the prohibited area, a decree which has not been accepted by Peru, and the principles regarding maritime warfare and protecting neutral ships. The Peruvian Minister at Berlin has also been instructed to declare that Peru does not accept, and will not accept, the decision to

submit this case to the German prize court, and insists on claiming fair reparation and due compensation."—*The Army and Navy Gazette*, 18/8.

PORTUGAL

MUTINY.—A British Admiralty announcement states that mutinies have broken out aboard some of the Portuguese warships.—*Washington Post* 5/9.

RUSSIA

MINISTER OF MARINE.—Admiral D. N. Verdervski, formerly commander-in-chief of the Baltic fleet, has been appointed Minister of Marine.

Dmitri Nicoleievitch Verdervski is a well-known writer on naval technical questions. He has passed most of his life on board ship. Before the revolution he was suspected of being a secret critic of the autocracy. In July last, Russian newspapers announced that Admiral Verdervski had been arrested for communicating a secret government telegram to the sailors' committee of the Baltic fleet. The new Minister of Marine has always been considered a strict disciplinarian.—*N. Y. Herald*, 14/9.

BLACK SEA SHIPYARDS.—According to *Russia*, a journal of Russian-American trade, another Black Sea shipyard is planned. "While the shipping discussion proceeds, there are some interesting attempts at concrete undertakings in the way of shipbuilding. The obviously great demand that is impending for vessels for the Black Sea and Mediterranean service has already led to the launching of a great shipbuilding enterprise at Kherson, which is one of the important and growing Black Sea ports, although it is situated on the banks of the Dnieper River some miles from the actual Black Sea waters. A second large plant is now planned for Kertch, on the west side of the Yenikale Strait connecting the Black Sea with the Sea of Azov.

"Application has been made to the Kertch municipality by the Azov-Don Commercial Bank for the sale of about 80 dessiatins (216 acres) of land situated near the metallurgical works, to be used for a shipbuilding plant. According to the terms proposed by the bank, the subscribed capital of the undertaking is to be not less than five million rubles ($2,575,000). Construction is to be started within one year after the Russian Government signs a treaty of peace, and the expenditure on the plant in the first three years of development is to be not less than two and a half million rubles ($1,287,500)."—*The Nautical Gazette*, 23/8.

RAILROAD CHAOS.—"Deplorable" is the word used to describe the condition of railway equipment in Russia by Chief Traffic Manager Shubersky, in charge of railway transportation along the front. He has just made a report to the Committee of Engineers of the Department of Communications. He declared the work accomplished during the five months since the revolution "tragic." He cited figures to show that at the end of the present half year there were 700,000 freight cars less than in the same period a year ago.

"At the beginning of 1917," said M. Shubersky, "there were 34,000 broken locomotives, or 16½ per cent of the total. To-day there are 52,000, or 25 per cent. Similarly, the cars out of commission were 25,000, or 4.8 per cent, against a present number of 46,000, or 8 per cent. The speed of trains has been reduced from 72 versts daily to 52." General political and economical disorganization is the reason given.—*N. Y. Times*, 25/8.

SWEDEN

CRUISER LOST.—The Swedish torpedo-cruiser *Clas Uggla*, which recently went aground in the Gulf of Bothnia, was caught by a heavy gale August 31 and completely wrecked. The ship is a total loss.

The *Clas Uggla* was built in Stockholm in 1899. She displaced 787 tons and carried a crew of 100 men.—*Washington Post*, 9/1.

UNITED STATES

NEW DESTROYERS.—President Wilson has approved Navy Department estimates for an expenditure of an additional $550,000,000 for new destroyers. Of this amount it is proposed to expend one-half in the increase of building facilities. Secretary Daniels' statement in explanation of the situation is as follows:

"The general board of the navy, the chief of operations of the navy, and a special board on the submarine menace, recently ordered to consider and report upon the whole subject, are agreed in believing that, at present, the construction of a maximum number of destroyers is the most desirably material development for the navy. The large orders for additional destroyers under the naval emergency fund in the last naval bill and the pending deficiency in this fund absorb all the present facilities for destroyer construction in the country which give promise of prompt delivery. In order to undertake, with reasonable assurance of early completion, the large number of additional destroyers which the military situation renders desirable, it will be necessary to provide entirely new facilities for building the hulls and machinery and their appurtenances. The Navy Department is assured that it is physically possible to provide these additional facilities. It will be desirable to locate those which are not necessarily on the seaboard in the interior of the country in order to facilitate obtaining the necessary labor. Moreover, if this project is undertaken, direct and prompt action is essential if the desired results are to be obtained, and Secretary Daniels will urge early authorization and appropriation by Congress."

The admission of the Secretary that existing contracts for destroyer construction absorb the present facilities of the country for that purpose has created more or less comment. While an impression to that effect has prevailed, it has been considered as a situation which it was not eminently desirable to reveal. It has produced the result of inducing firms to appeal to the Navy Department for an allotment from the new destroyer appropriation for the purpose of defraying the cost of expanding plants and installing additional facilities. Estimates of this cost have been received from various firms, extending from considerably less than $100,000 to several million dollars. In those cases where the new installation is of permanent value and is destined to be of advantage to the shipbuilders, the government will make a deduction from the expenditures at a final adjustment. In the meantime, the effect of this expenditure is to add that much to the cost of destroyers, the work on which is necessarily expedited, for which the government must expect to pay. The departmental statistics show that this cost of new facilities distributed among the destroyers produced will not bring the cost of each boat beyond a figure which may be regarded as reasonable in view of the "speeding-up" process which must be applied in order that the power of the fighting force afloat shall be appreciably increased.—*Army and Navy Register*, 1/9.

Immediate expansion of building facilities of the United States to double or treble the output of destroyers during the next 18 months was the object of a conference between Secretary Daniels and representatives of 25 or more ship and engine builders.

"If we get what we want," the Secretary said, "the United States will have more destroyers than any other power. They are the one thing that a submarine fears."

The Secretary indicated that all the destroyers the builders could produce would be ordered. Every effort of the department will be laid upon speeding up the large number of contracts now pending.

Every aspect of shipbuilding that bears upon destroyer production was taken up at the conference. There is no shortage of material or plant facilities, but a difficulty lies in obtaining high-power engines, boilers and reduction gear.

Secretary Daniels said no additional submarine chasers would be ordered at present. The chasers are valuable for harbor and in-shore patrol work, but the destroyers are far superior even for these duties and have, in addition, sea-going qualities which make them of far greater value in all ways than the small chasers.

Every suggestion that the ship or engine builders had to make as to additional motive power for the destroyers was given close attention. The possibility of making some of the new vessels with oil engines was among the suggestions offered.

As to the plants at which the new destroyers will be laid down, Secretary Daniels said he favored expansion of the plants now building destroyers as the most efficient means of speeding up. Experience gained in previous building will enable such plants to turn out new ships more quickly, it is felt, than would be possible for a new plant, lacking that experience.

Secretary Daniels' decision shows that the officers who have been contending that the best answer to the U-boat was to turn out an enormous number of destroyers have carried their point. The experience of all allied navies that the destroyer is more deadly to submarines than any other type of craft is borne out by reports from Vice Admiral Sims, founded on the actual experience of American destroyers in European waters.

Another aspect is the problem of furnishing convoys to troops and supply ships, which will grow as American forces in France are increased. Many officers now believe that destroyer convoys guarantee a large degree of security from submarine attack. The thing needed, in their view, is an adequate number of destroyers to make it certain that supply lines are not interrupted. The department apparently has approved this view.

No figures have been made public of the number of destroyers now building. Secretary Daniels said, however, that they represent the maximum capacity of the country as the builders and engine and boiler makers are at present equipped. To expand that capacity will require the expansion of every existing plant and the addition of new engine and boiler works.—*N. Y. Times*, 20/8.

NAVY DEPARTMENT ESTIMATES.—The Secretary of the Navy has submitted an estimate of appropriation urgently required by the naval establishment for the purpose of acquiring and providing facilities for the expeditious construction of additional torpedo-boat destroyers, amounting to $225,000,000. The proposed cost will add $125,000,000 to this amount. Authority is requested to place this money in the hands of the President to be expended in his discretion. The enactment of the following provision is requested:

The President is hereby authorized and empowered to acquire or provide facilities additional to those now in existence for the construction of torpedo-boat destroyers, their hulls, machinery, and appurtenances, including the immediate taking over for the United States of the possession of and title to land, its appurtenances and improvements, which he may find necessary in this connection.

That if said lands and appurtenances and improvements shall be taken over as aforesaid, the United States shall make just compensation therefor, to be determined by the President, and if the amount thereof, so determined by the President, is unsatisfactory to the person entitled to receive the same, such person shall be paid 75 per cent of the amount so determined by the President and shall be entitled to sue the United States to recover such further sum as, added to said 75 per cent, will make up such amount as will be just compensation therefor, in the manner provided for by Section 24 and Paragraph 20, Section 145 of the Judicial Code.

Upon the taking over of said property by the President as aforesaid, the title to all property so taken over shall immediately vest in the United States.

Additional estimates required are as follows:

Ammunition for vessels	$15,146,120.00
Batteries and outfits for vessels	28,059,523.50
Reserve and miscellaneous ordnance supplies	17,500,000.00

—*Army and Navy Register*, 15/9.

SUBMARINE CHASERS UNSATISFACTORY.—The report of Vice Admiral Sims, made to the Navy Department recently, that submarine chasers would never solve the submarine menace problem, will not cause any astonishment to the thoughtful citizen, as after nearly three years' experiment with this method by Great Britain the U-boat outrage is growing rather than diminishing. It is evident that something much more effective is needed, and Uncle Sam will doubtless solve the problem. The abandonment of the "chaser," moreover, will have the effect of releasing hundreds of shipbuilders and much material for other work. In tackling the submarine problem we should eliminate everything that has been tried unsuccessfully up to the present and evolve an entirely new offensive. Every chess player knows that if he wishes to beat an equally matched opponent he must start out on an entirely new tack; and he will, more often than not, win. War is something like a game of chess on a great scale and surprise in attack in the game of war is often more effective than the use of any other tactics.—*The Marine Journal*, 8/8.

S. P. BOAT DELIVERED.—The first of 10 submarine chasers ordered by Secretary Daniels for the government from the College Point Boat Corporation, College Point, L. I., was delivered September 8, within the time limit of 110 days stipulated in the contract. All details concerning the craft, except that it is 110 feet long, were withheld.

Delivery of the second submarine chaser will be made September 10, the others to follow at 10-day intervals. They will form part of the 357 boats of this kind that were ordered nearly four months ago by Secretary Daniels, and which, it is expected, will be more effective against the U-boats than anything in use at present.—*N. Y. Herald*, 9/9.

SPEEDING CONSTRUCTION.—On the expectation that Congress will quickly appropriate the necessary $300,000,000 for the great destroyer building program, tentative contracts have been drawn with the Cramps, the yards at New York, Fore River, Newport News and the Union Iron Works at San Francisco, on a percentage basis not yet fixed, with the understanding that the full force of the government is behind every concern to facilitate the most rapid construction. The companies have been given to understand that, whenever necessary, the government is prepared to assist in the enlargement of facilities and to commandeer materials.

All specifications have been agreed upon and arrangements made for closing subcontracts without delay.—*N. Y. Herald*, 14/9.

Ship and engine builders now have all the naval work existing plants can do, and also are obligated to the limit of their financial arrangements. They propose that the government expand the yards and engine plants, that the private builders do the work, using their trained forces, supplemented by all the additional men that can be procured, and that, at the conclusion of the war or the contracts, as the government may decide, the supplemental plants either be sold to the shipbuilding companies or operated on government work. Details of the scheme are now being worked out at the Navy Department. The destroyer program includes as many new ships of that type as it is possible to build.—*Shipping Illustrated*, 25/8.

SHIPS RE-NAMED.—Almost all former German vessels now in the U. S. Navy have been given new names. Secretary Daniels has issued an order changing the names of 12 ships as a result of his attention having been

called to the embarrassment the sailors were subjected to by being compelled to wear upon their hat bands names such as *Kaiser Wilhelm II*. The changes of name are:

Vaterland to *Leviathan, Kronprinzessin Cecilie* to *Mount Vernon, Kaiser Wilhelm II* to *Agamemnon, Amerika* to *America, Hamburg* to *Powhatan, Grosser Kurfurst* to *Aeolus, Koenig Wilhelm II* to *Madawaska, Neckar* to *Antigone, Rhein* to *Susquehanna, Princess Irene* to *Pocahontas, Frederick der Grosse* to *Huron, Barbarossa* to *Mercury.*

The *George Washington, President Lincoln* and *President Grant* will not be re-named. The names of the tugs *Pocahontas, Huron* and *Powhatan* are changed to *Allegheny, Chemung* and *Cayuga*, respectively.—*Shipping*, 8/9.

TWENTY-THOUSAND-TON FLOATING DRY DOCK BEING INSTALLED AT SPARROW'S POINT.—The Bethlehem Steel Corporation is installing at its Maryland shipbuilding plant, Sparrows Point, Md. (formerly Marine Department, Maryland Steel Company), a floating dry dock of 20,000 tons lifting capacity, designed by William T. Donnelly, naval architect and consulting engineer, New York.

The pontoons of the dock are of wood, and contain 4,000,000 feet of yellow pine. The side walls or wings are of steel, 3000 tons of steel being required for their construction.—*International Marine Engineering*, September.

U. S. TO BUILD THREE GREAT SHIPYARDS.—On August 30 contracts were signed at Washington by the Emergency Fleet Corporation for the construction of three government-owned shipyards for the building of fabricated steel merchant vessels. The yards will cost $35,000,000, and an option is given the government to purchase the lands on which they are located. The builders of the yards received contracts for 200 vessels.

The plants will be constructed for the Submarine Boat Company, the American International Corporation, and the Mercantile Shipbuilding Company. The plant of the Submarine Boat Corporation will be built on Newark Bay, N. J., and will, it is estimated, be capable of turning out one 5000-ton, high-speed steel vessel every two days. The plant of the American International Corporation will be located on Hog Island, near Philadelphia, and that of the Mercantile Shipbuilding Company at Chester, Pa. Each plant will be of equal capacity.

The wooden ship controversy, which has caused so much trouble and delay in the construction of merchant vessels, and which resulted in the resignation of William Denman, Chairman of the Shipping Board, and General Goethals, is apparently settled now, and wooden construction for the present is at an end, although it is understood that contracts have been made with more than 60 firms for the construction of wooden vessels. Several forces have contributed to this condition, chief of which is the difficulty in obtaining timber in the South and on the Pacific coast. Labor troubles on the Coast are also hindering this work, and the officials have concluded that the present program of wooden construction calls for more than enough of this slower type of vessel.—*The Nautical Gazette*, 6/9.

ORDNANCE AND GUNNERY

ANTI-SUBMARINE SMOKE BOXES.—The Bureau of Ordnance of the Navy Department is having manufactured by the du Pont Co. smoke boxes suitable for use by merchant vessels as a means of escape from attacking submarines. Merchant vessels desiring to procure these smoke boxes can obtain them from the du Pont Co. The cost will be approximately as follows: Smoke funnel, $125 each; phosphorus, $1.75 per pound; smoke boxes, $25 each. The smoke funnel is for the production of smoke on board the vessel and requires only the fuel for its continued use. The smoke

boxes are for throwing overboard, and once used cannot be recovered. The Navy Department is preparing to issue smoke boxes to all vessels carrying armed guards, and has announced as its policy that smoke-producing apparatus for the use of merchant vessels should be available for every vessel desiring to purchase same. It is urged that merchant vessels give prompt and favorable consideration to the desirableness of purchasing smoke-producing apparatus. The War Instructions for Merchant Vessels of the United States, issued by the Navy Department, contains directions for the use of smoke-producing apparatus, and the Bureau of Ordnance of the Navy Department issues a pamphlet dealing with the particular type of smoke-producing apparatus manufactured by the du Pont Co.—*Army and Navy Register*, 18/8.

ANTI-AIRCRAFT GUNS.—An order has been placed by the Navy Department for 1000 anti-aircraft machine guns. These will be of the Marlin type and will be constructed by the Marlin-Rockwell Company of New Haven, Conn., at about $425 per gun.—*Army and Navy Register*, 1/9.

DEFECTIVE SMALL-ARMS AMMUNITION.—Newton D. Baker, Secretary of War, admitted to the Senate Military Affairs Committee that, although a defect affecting one-third of the small-arms ammunition supplied to the expeditionary forces in France was discovered on May 25, the fact was not communicated by the War Department to Major General Pershing, commander of the American troops in France, until August 1.

Mr. Baker made the admission in the course of a frank statement covering the facts concerning the discovery of defective ammunition made at the Frankford government arsenal during the period between January 1 and June 1, 1917. General Crozier, chief of the Bureau of Ordnance, who sat with Mr. Baker before the committee, estimated that only about one-hundredth of the army's whole supply of small-arms ammunition is actually defective, but admitted that progressive deterioration might render as much as one-tenth of the whole supply useless.

Mr. Baker told the committee that large quantities of the suspected ammunition were shipped to the expeditionary forces in France, but said that thus far no complaints have been received by the commanding officers. General Crozier stated that the expeditionary forces were so well supplied with other ammunition it was probable they had not yet used any of the suspected class. The defective ammunition was plainly marked, he said, and could be easily segregated so that no harm would result.

Senator Chamberlain, of Oregon, chairman of the committee; Senator Hitchcock, of Nebraska, and Senator Fletcher, of Florida, all questioned Mr. Baker to learn whether the treachery of employees at the Frankford Arsenal or the machinations of German agents were suspected as the cause of the defect, but to all the inquiries along this line Mr. Baker consistently replied that a heretofore unknown freak of chemistry was responsible for the fault.

Declaring that "the mind of the country should be relieved by a simple statement of the facts," Mr. Baker advised the fullest publicity regarding the defect. The first report of trouble with the ammunition came from the Navy Department on May 25, he said. It was reported then that some of the small-arms ammunition which had been supplied by the army to the Marine Corps was defective. Later, reports began to come in from various units of the army and from rifle clubs that some of the cartridges were causing "miss-fires" and "hang-fires."

"These reports were widespread enough to indicate a fairly general character of the defect," said Mr. Baker. "The Frankford Arsenal began an investigation immediately. The defect was an entirely new thing. The arsenal has now discovered what it believes to be the real cause. A small quantity of potassium bromate has been found in the potassium chlorate which is used in the manufacture of the primers. In the presence of free

sulphur which exists in these primers a deterioration results. When kept for some months the defect develops in the ammunition and the 'hang-fires' and 'miss-fires' result."

Mr. Baker said the Frankford Arsenal began using the new formula about January 1, 1917.

"Is there any possibility that this potassium bromate was placed in the potassium chlorate by design?" asked Senator Hitchcock.

"I believe that that possibility is excluded," said Secretary Baker. "The possibility of the ammunition breaking down from this cause is so remote it is unlikely that anyone having designs to cause defects would have relied upon it."

"Couldn't this defect have been prevented by inspection?" asked Senator Hitchcock.

"No; its recurrence can, though," answered Secretary Baker, who said he wanted to make it clear that the defect didn't affect the whole supply. He explained to the committee that the army was getting the bulk of its small-arms ammunitions from private manufacturers who used a different formula for primers.

General Crozier interrupted to say that the Frankford Arsenal production amounted only to about one-tenth of the army's supply and that only about one in ten of the suspected cartridges were being found defective. He admitted, however, that a higher percentage of defective cartridges might develop.

Answering an inquiry by Senator Hitchcock, Secretary Baker said there was no need in minimizing the importance of the discovery. "I regard it as of the greatest importance," he said. "The discovery has enabled us to remedy the defect before any serious damage has been done."

"Is there any foundation for the printed reports that the War Department has accepted some ammunition which was rejected by the Allies?" asked Senator Hitchcock.

"Absolutely none," answered the Secretary.

"Why was it that you did not call the attention of the expeditionary force to the defective ammunition until August 1, although the defect was first reported May 25?" asked Senator Chamberlain.

"We first thought the defect might affect only a particular batch of ammunition," answered Secretary Baker. "There was no complaint whatever from the expeditionary forces. Gradually, however, reports began to come from other units and in the course of some time we were led to the conclusion that the defect was of the general character that was later found to be the case with the Frankford Arsenal."

"No harm has been done," said General Crozier, "except the loss of labor in breaking up the suspected ammunition."—*N. Y. Herald*, 6/9.

EXAMINATION OF DEFECTIVE AMMUNITION.—The Secretary of War has appointed a special committee of two civilians and one army officer to make an investigation into the defective cartridges manufactured at the Frankford Arsenal. He has appointed Dr. H. T. Talbot, Professor of Chemistry at the Massachusetts Institute of Technology; Dr. Parsons, of the Bureau of Mines, as the civilian members of the committee, and Major General Hugh L. Scott, chief of staff, representing the army. This action was taken by the Secretary of War in view of the insistence of the Senate and House Military Committees that full information be laid before Congress concerning the rumors that defective ammunition has been supplied to our forces in France. Secretary Baker was before the Senate Military Committee this week and informed that body that a very small percentage of the ammunition was defective and expressed the belief that the difficulties have been overcome. The House Military Committee unanimously reported a resolution providing for the appointment of a select committee of seven members, from the membership of that committee, to inquire into the manufacture and purchase of ordnance and ammunition. The chairman of

the committee introduced the resolution and a meeting of the committee was promptly called and the report submitted the following day, the committee being of the opinion that the matter was of sufficient seriousness to warrant a special investigation at the earliest possible moment.—*Army and Navy Register*, 8/9.

NITRATE PLANTS.—Immediate construction of government plants necessary for the production of nitrates required for the manufacture of munitions will be begun, the War Department announced September 6, when it made public the general recommendations and report of the Nitrate Supply Committee.

The plants will be built in southwestern Virginia, which territory affords, according to the committee, the best natural resources for the enterprise. The exact location is being withheld until final arrangements are made. Meantime War Department officials are supplying machinery and materials needed for the plants. Within an extremely short time, officials declare, the government will be producing its own nitrate under a $20,000,000 appropriation by Congress.

Newton D. Baker, Secretary of War, has accepted the recommendations of the Nitrate Supply Committee, which he appointed under authority granted in the National Defence Act for an investigation "to determine the best, cheapest and most available means for the production of nitrate and other products for munitions of war and useful in the manufacture of fertilizers and other products."

The members of the committee are Brigadier General William Crozier, chief of Ordnance, War Department; Rear Admiral Ralph Earle, chief of the Bureau of Ordnance, Navy Department; Brigadier General William M. Blacvk, chief of Engineers, U. S. A.; F. W. Brown, Bureau of Soils, Department of Agriculture; Leo H. Baekeland, Yonkers, N. Y.; Gano Dunn, New York City; Charles H. Herty, New York City; William F. Hillebrand, Bureau of Standards, Department of Commerce; Arthur A. Noyes, Institute of Technology, Boston, Mass.; Charles L. Parsons, Bureau of Mines, Interior Department, and Willis R. Whitney, Schenectady, N. Y.

The general recommendations and report of the committee in part follow:

"1. The committee, appreciating the offer of the General Chemical Company, recommends that the government enter into negotiations to acquire the rights to use the synthetic ammonia process of that company.

"2. That contingent upon satisfactory arrangements with the General Chemical Company, out of the $20,000,000 nitrate supply appropriation such sum as may be needed, now estimated at $3,000,000, be placed at the disposal of the War Department to be used in building a synthetic ammonia plant of a capacity of 60,000 pounds of ammonia each 24-hour day. In the opinion of this committee, all of these conditions just enumerated are best fulfilled by a location in southwest Virginia or contiguous region.

"3. That out of the $20,000,000 nitrate supply appropriation an amount now estimated at $600,000, or as much as may be needed, be placed at the disposal of the War Department to be used in building a plant for the oxidation of ammonia to nitric acid and the concentration of nitric acid, of a capacity equivalent to 24,000 pounds of 100 per cent nitric acid in a 24-hour day, said plant to be in the neighborhood of the aforesaid synthetic ammonia plant and the proposed new powder plant of the government.

"4. That the War Department proceed at the earliest practicable date with the construction of the oxidation plant and, contingent upon a satisfactory arrangement with the General Chemical Company, also with the synthetic ammonia plant.

"5. The committee appreciating the offer of the Nitrogen Products Company, granting, in this country, to the government under certain conditions the right to use the so-called Bucher process for the production of sodium

cyanide and ammonia, recommends that a form of contract such as to give that company no guarantee or exclusive rights in the process, or in its future development, beyond those which the company's own patents give to it, be entered into with the Nitrogen Products Company and that experimentation looking toward the development of the Bucher process for the production of ammonia be at once proceeded with. And further, that contingent upon a satisfactory arrangement with the Nitrogen Products Company, a sum not to exceed $200,000 be allotted for this purpose out of the $20,000,000 nitrate supply appropriation."—*N. Y. Herald*, 7/9.

MACHINE GUNS.—The War Department announcement that the Forty-second Division, or, as it is already popularly known, "The Rainbow Division," will have as one of its units the One Hundred and Fiftieth Machine Gun Battalion, again calls attention to the tremendous importance of the machine gun in modern warfare. Recently *The Times* printed an article by a British officer in which he referred to the various kinds of machine guns used in the British Army, and in the article which follows another officer of the British Army, now serving on the French front, tells of the great part that this weapon plays in assaulting activities.

The article, which was given to *The Times* by an official of the British Government on duty in this country, is as follows:

"The successful assault of a modern trench system demands the full power of every offensive weapon that human ingenuity has evolved under the stimulus of long-continued war, applied in exact co-operation with each other. The devastating hail of preparatory bombardment and the terrible curtain of the barrage that cuts off reinforcement or retreat from the defenders, the showers of bombs that shall drive them from traverse to traverse or annihilate them in their burrows, the bursts of fire from the Lewis guns that strike them down as they strive to rally to a nucleus, the rifle shot and the bayonet thrust that account for them man to man—all these are indispensable and might alone confer success.

"But fearful as the artillery barrage is, there are gaps in it. Men may and do escape through it. A concealed enemy machine gun opening at the moment of crisis will only be knocked out by a chance hit. Unless the artillery observation officers are exceptionally fortunate their batteries will scarcely be able to switch on to an unexpected target before the opportunity has passed. The flanks of the onrushing infantry may be suddenly assailed by an enemy wave issuing from an unexpected place of shelter. To meet these sudden emergencies, to supplement the hail of death so that there may be no escape from it, the general has a comparatively new source of offensive action in the machine gun company attached to his brigade.

"The brigade commander who receives his orders to attack a certain length of the enemy's line consults not only the chiefs of his battalions, but also the expert officer commanding the machine gun company of the brigade. He explains the intended operation and indicates the points from which he apprehends danger. There is a line of trench and its offshoots in front; some hundreds of yards behind that line is another; on the enemy's left rear is a wood, on his right flank is a ravine. From rear trench, flanking wood or ravine, the counter-attack may surge out on the disordered assault ere it can consolidate itself in the new position.

"However thorough the artillery bombardment and the barrage, deep dugouts may have afforded protection until it has passed. The brigade commander consults with the commanders on his flanks. He arranges that the company on his right shall take the wood under enfilade fire, the company on the left shall search the ravine. His own sections of four guns each are carefully disposed to be able to fire over the heads of the attacking troops and to create a barrage of thousands of bullets ceaselessly striking in deep, continuously linked zones between the rear trench and the objective.

"For a number of minutes, previously decided upon, the machine-gun barrage hails steadily on the same belt. Then again it lifts for another

hundred yards. And behind its sleet the attack passes on. So that tempest of bullets falls in a fierce shower for its remorseless period, then lifts and passes onward to another stage. Leap by leap it reaches the trench in the rear by which the reinforcements of the enemy must arrive. The storm descends on the crowded earthway, fills it with prone men who no longer move, though the bullets continue to strike.

"Then it ceases—hails again in short bursts that catch parties of the enemy risking a dash toward their desperately struggling comrades. Now far behind the turmoil of the fighting the machine gunners crouch beside their weapons, an officer to every two guns. Keenly he watches the battlefield, the smoke-hung waste of tumbled brown earth where figures emerge, run, walk with a curious air of leisure or fall suddenly under a canopy of fume and white puffs. With the experienced eye of the professional he spots a movement, a whiff of dust on the confused level of the earth. It is an enemy machine gun firing from a shell hole. A swift order, a rapid hammering—and the whiff of dust settles to reappear no more.

"The counter-attack is beginning to gather itself on the fringes of the fight. Gray figures mass in the wood, the rear trench, the flanking ravine. An S. O. S. signal goes up from the infantry realizing its peril. Then the machine guns burst out in the full fury of their appalling power. Along the far trench is one incessant hail. The masses—that have scarcely coalesced—melt, disappear, become isolated figures that run and fall.

"Far ahead the protection detachments have consolidated a line of shell holes. Groups of limp prisoners are shambling and stumbling to the rear. The vengeful shells begin to fall on the victors of the position."—*N. Y. Times*, 26/8.

TORPEDO-PLANE.—Desiring to encourage greater preparedness in naval aeronautics, Godfrey L. Cabot, of Boston, one of the vice-presidents of the Aero Club of America, has placed the sum of $30,000 at the disposal of Rear Admiral Bradley A. Fiske, U. S. N., retired, that he may produce a torpedo-plane capable of carrying the heaviest torpedo from England to Kiel and has intimated that if more money is required to complete this latest type of aerial war machine it will be forthcoming.

It is hoped that the action of Mr. Cabot will bring to fruition the work which the Aero Club of America has been engaged upon, of developing the torpedo-plane able to sink a battleship. The British sunk four Turkish vessels with torpedo-planes in August, 1915. The British warship *Gena* was sunk by a German torpedo-plane off the coast of England, May 1, 1917.

Last January the Aero Club set aside a sum of money to have a small torpedo made suitable for use from ordinary aeroplanes. When the question was taken up with the E. W. Bliss Company they patriotically decided to develop the torpedo at their own expense.—*N. Y. Herald*, 7/9.

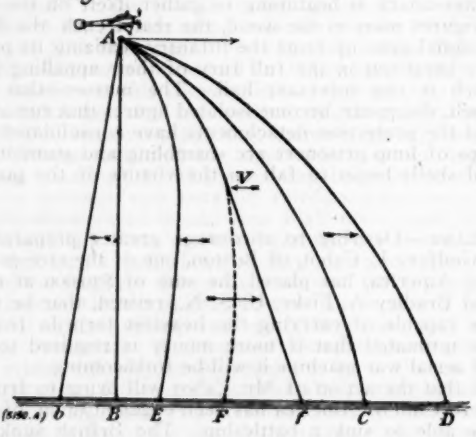
PRODUCTION OF EXPLOSIVES.—The production of explosives in the United States during 1916 was in excess of 500,000,000 lbs., an increase of about 44,000,000 over 1915. The total included 215,575,025 lbs. of black powder, 253,154,787 lbs. of "high" explosives, other than permissible explosives, and 34,685,240 lbs. of permissible explosives. The value of the exported explosives, which in 1914, the first year of the war, were valued at about £2,000,000, reached a total value in 1916 of some £144,000,000.—*The Engineer*, 24/8.

AERIAL BOMBARDMENT.—In the course of an aerial fight last February Captain Guynemer brought down in the French lines one of the large German bombing aeroplanes built by the Gothaer Waggonfabrik A. G., several features of which are reviewed in *La Nature*.

In its opening remarks the French journal states that a bomb dropped from a fixed point, without initial velocity and in the absence of any wind, is submitted in its fall to two forces, acceleration due to gravity and air

resistance, these forces remaining constant for all bombs of the same type; the trajectory of fall is then a vertical from point *A* to point *B*, in Fig. 1. If the bomb be dropped from a machine flying at a certain speed, the bomb at the instant it is released has an initial velocity which is equal to the speed of the machine and is in the same direction. The new force, in combination with acceleration and air resistance, gives a trajectory such as *AC*. If the bomb be thrown at a certain initial velocity in a layer of air in motion, it is subjected to a drift; with a rear wind the trajectory lengthens and becomes *AD*, and with a head wind it becomes *AE*. When the bomb is dropped from a machine whose travelling speed is practically equal to the velocity of the wind opposed to it, the bomb has no initial velocity and its trajectory becomes *Ab*, but this case is an extremely rare one, since it supposes a wind velocity equal to the machine speed (75 miles to about 95 miles per hour), conditions in which no machine would undertake a flight.

Fig. 1.



Given these trajectories, the sighting angle will be that formed by the vertical *AB* at the dropping-point *A* with the straight line joining the dropping-point *A* to the point of fall *O*, or the angle *BAO*. The trajectories are curves, and the height of the machine above the target is an element which intervenes to modify them. The bombs undergo under the action of the wind a drift which varies with the shape of the bomb and the velocity of fall.

To sum up, the trajectory of a bomb dropped from a flying machine is the resultant of the following forces:

Weight, shape and drift, which are constant elements for bombs of a given type.

Speed of the machine in the air, an element considered constant for a given type of machine.

Height of fall, initial velocity of the bomb (or speed of the machine in relation to the ground), velocity of head wind, which are variable elements.

Of these three principal variable elements which have to be known for each bombardment, one, the velocity of the head wind, is deduced as soon as the speed of the machine with reference to the ground is known, the wind velocity being the difference between the speed of the machine with reference to the ground and its normal speed in the air. It is therefore only necessary to ascertain the height of the machine and the initial velocity

of the bomb for determining a trajectory. This method of calculating trajectories endeavors to find a basis in science for obtaining results mathematically exact. But atmospheric conditions intervene, and these are most variable. For example, the wind velocity is accounted for at the height at which the machine travels, probably 12,000 feet; but generally this velocity varies between the height of the machine and the ground-level to such an extent that notwithstanding the best calculations and the care of the most expert airmen deviations occur which lead some flying men to despair of ever attaining in an aerial bombardment results commensurate with the efforts exerted.

The Goerz sighting apparatus is certainly the most carefully finished and most improved instrument which German science has produced to attempt the destruction of objects out of the range of heavy guns. It consists of a telescope approximately 1 m. in length, mounted on a universal joint, able to take any direction and to be maintained rigorously vertical, whatever be the position of the machine. It is illustrated in Fig. 2. Fig. 3 shows the optical system; the field is 500/1000 and the magnification 1.5. At the foot of the telescope is a prism mounted on a pivot which is actuated by a disc graduated in degrees. When the instrument is vertical the action of the prism allows the visual ray to be inclined by a number of degrees corresponding with the graduation on the disc. There are two scales on the disc, one corresponding to the vertical speed, the "dead-point" of the instrument, and the other to a sight at 22 degrees, 30 minutes. Another scale on the body of the telescope acts as a basis index. At 0 degrees the ground is seen vertically (Fig. 4); at 22.5 degrees the incline of the visual ray is 22.5 degrees in front of the machine (Fig. 5); and at 5 degrees the incline is 5 degrees to the rear (Fig. 6). A small index is mobile on the disc, but it can be locked to it by means of a small, knurled head. When this index is fixed in front of a graduation of the disc it falls into a notch when reaching the "dead-point," and indicates to the bomber that he sees the ground at the inclination which he had marked with the index. A spirit level is located in the instrument, and the edges of the air bubble are refracted in such a way that they appear as a dark circle, which serves as a sighting center. The bomber has to maintain the air bubble at the center of the eye-piece during all his sighting operations; this keeps the instrument vertical whatever be the incline of the machine. The universal joint above referred to allows the instrument to be worked freely from right to left and from front to back, but when it turns round its vertical axis, *i. e.*, when the visual ray, instead of being directed to the front or to the rear of the machine, is directed to right or left, the instrument acts upon a direction corrector. This latter is an electrical device, in which resistances act upon a highly sensitive galvanometer placed in front of the pilot, which indicates to him the rectifications he must make to fly exactly above the target.

The German arrangement allows the calculation of the three following elements. In the first place, the height of the machine above the target; this is obtained by deducting the height of the target from the height of the machine shown by the altimeter. This element, at high altitudes, can only give rise to slight errors. Thus at a speed of 90 km. (56 miles) an error in altitude of 500 m. (1640 feet) on a machine at a height of 4000 m. (13,200 feet) only corresponds to an error of 25 m. (82 feet) on the ground (see Fig. 7).

In the second place, it allows of calculating the initial velocity of the bomb. This is in reality the velocity of the bomb in relation to the ground, and is the element the most difficult to arrive at, because it varies with the speed of the wind, which itself varies constantly. If a machine develops a speed of 150 km. (93 miles) in a rear wind travelling at 50 km. (31 miles), the machine will run practically at a speed of 200 km. (124 miles), whilst with a head wind the speed would be half the latter figure. This leads to considerable modifications in the trajectories, as shown in Fig. 7. Instead

FIG. 2

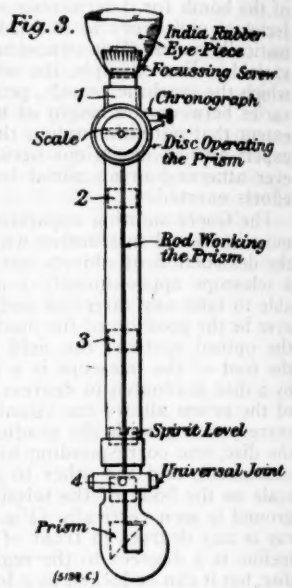


Fig. 3.
India Rubber Eye-Piece
Focussing Screw
1
Chronograph
Scale
Disc Operating the Prism
2
Rod Working the Prism
3
Spirit Level
Universal Joint
4
Prism

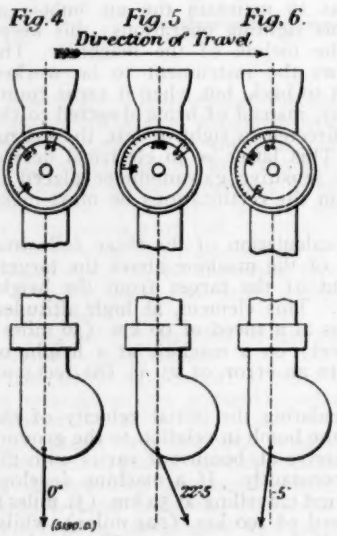


Fig. 4
Fig. 5
Fig. 6.
Direction of Travel
0°
22·5
5°

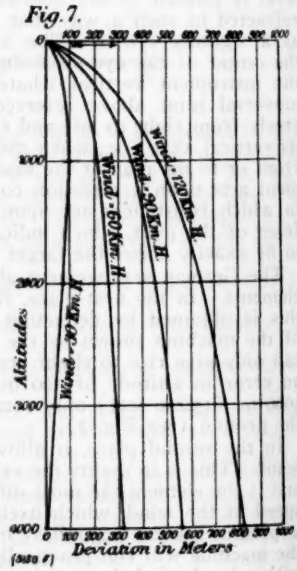
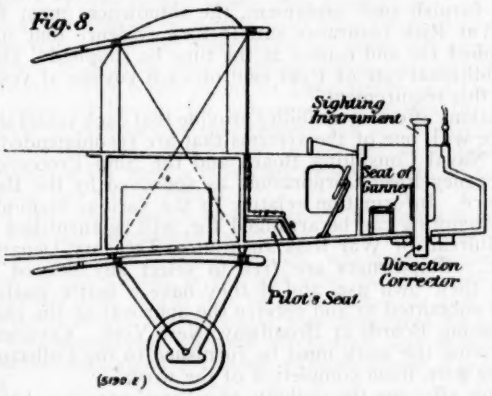


Fig. 7.
Altitudes
Deviation in Meters
Wind - 30 Km. H.
Wind - 60 Km. H.
Wind - 90 Km. H.
Wind - 120 Km. H.

of adding the speed of the wind to that of the machine, or subtracting it, the two speeds may be compounded. If, for example, the wind strikes the machine in other direction than the line of flight its component must be added or subtracted in the usual way. In principle, in order to simplify the calculations, it is necessary for the machine to carry out a bombardment in a head wind, that is to say, at the least possible travelling speed. In order to determine this travelling speed of the machine one calculates the time taken by a point on the ground o to cover a determined angle, 45 degrees or 22 degrees, 30 minutes. It will easily be seen that the time, in seconds, taken by a machine to aim successively at the same point, first at an angle of 22 degrees, 30 minutes, then on the vertical, is proportional to the speed of the machine in relation to the ground. If, when the machine is at a height of 4000 m., a point on the ground takes 36 seconds to cover an angle of 22 degrees, 30 minutes, the machine will travel at 100 km. per hour with relation to the ground; if it takes only 18 seconds, the speed will be 200 km. per hour. These values form the initial horizontal velocity of the bomb.

Fig. 8.



Thirdly, the Gotha machines have a speed of 150 km. (93 miles) per hour when their engines run at their normal speed. If sighting shows that the speed with relation to the ground is only 100 km., the deduction is that the head wind has a speed of 50 m. All the elements of the trajectory are thus known, and it will suffice to read on the firing table what, under the conditions, is the suitable firing angle to insure that the bomb shall fall upon the target.

The instrument is operated by the gunner in front of the machine (Fig. 8). The releasing devices for the bombs are on his right-hand. A few minutes before arriving over the target he notes the height of the machine, which, less that of the target, gives the height of all of the bomb, and he notes the travelling speed with reference to the ground. The index of the graduated disc is fixed at 22 degrees, 30 minutes. Any point on the ground is sighted in front of the machine and is held in the circle formed by the air bubble; it is followed by turning the disc until the index falls in the "dead-point" notch; at this moment the chronograph is tripped and the point referred to continues to be followed up in the instrument until the o degree of the disc stops at the "dead-point." The chronograph is then stopped and shows a number of seconds, which from the firing table gives the speed of the machine with relation to the ground and the sighting angle to use, probably 10 degrees. The index is then placed on 10 degrees. At about 2 miles or 3 miles before arriving over the target this latter is taken in the field of the sighting piece, then in the air-bubble circle. At this instant the direction corrector acts and the galvanometer shows the pilot

that he is travelling so as to cause the machine to fly exactly above the target. At the moment when the index falls in the "dead-point" notch, *i. e.*, when the sight is at an angle of 10 degrees, the gunner releases the bomb, which falls "near the target."

During the whole time bombing lasts the pilot has to maintain the machine strictly face to the wind, the air bubble has to be maintained strictly in the center of the eye-piece, the play of the prism alone serving to find the target. The sighting is scientifically perfect, but the result depends upon the accuracy of the observations and deductions.—*Engineering*, 24/8.

PROTECTION OF MERCHANT VESSELS IN THE WAR ZONE.—In order to minimize the hazard to vessels trading to or from ports in Europe and on the Mediterranean coast of Africa, the government has established rules relative to the arming and visibility of all American vessels sailing to the war zone on and after October 1.

According to these rules, all vessels must be armed in accordance with the recommendation of the Navy Department, or if the Navy Department is unable to furnish such armament, the shipowners must furnish to the Bureau of War Risk Insurance satisfactory evidence that such armament has been applied for and cannot at the time be supplied. The bureau will charge an additional rate of 1 per cent on each voyage of vessels failing to comply with this requirement.

The regulations affecting visibility provide that each vessel shall be painted in accordance with one of the systems that are recommended by the chairman of the Naval Consulting Board and the Ship Protection Committee of the Emergency Fleet Corporation, as approved by the Bureau of War Risk Insurance. Information relative to the various methods of painting and how the painting can be arranged for, will be furnished upon application to the Bureau of War Risk Insurance, Treasury Department, Washington, D. C. Shipowners are free to select any one of the approved methods for their own use, and if they have a better method to offer it must be first submitted to and receive the approval of the chairman of the Naval Consulting Board, 11 Broadway, New York. Certificates from the party performing the work must be furnished to the Collector of Customs at the loading port, upon completion of the work.

Another rule affecting the visibility of a vessel provides that each steamer, at the time of sailing from the United States, must carry a sufficient supply of approved smokeless fuel to carry the vessel for not less than two daylight periods. This coal must be used during the daylight run while within the submarine zone. If the vessel is equipped with an improved system, whereby it can be operated without the emission of visible smoke from the stacks, it will not be required to comply with the above rule. All vessels operating through the submarine zone must also carry on deck one dozen approved smoke boxes, which will evolve smoke when thrown overboard.

Vessels must obtain from the Collector of Customs a certificate that all requirements affecting its visibility have been complied with. In the event of failure to obtain such a certificate, the bureau will charge an additional premium of one-half per cent for each voyage. The bureau reserves the right to decline to insure vessels whose owners have not, in the opinion of the bureau, made a satisfactory effort to comply with these requirements.

The above rules are in accordance with recommendations made by the Ship Protection Committee of the Emergency Fleet Corporation. Other recommendations were made at the same time, but have not yet been tested out sufficiently to warrant their being adopted. One of the most important of these is the recommendation made by William T. Donnelly, a member of the committee, providing that ships shall be equipped with buoyant means, so that the ship will be practically unsinkable, however seriously the hull may be damaged by torpedo or mine attack. One of the German ships taken over by the government at a southern port is now being fitted out in accordance with this recommendation, and tests will soon be made to

determine the desirability of equipping all vessels in such a manner. The method of carrying this out consists in fitting between the frames, along the sides of the vessel and against the bulkheads, watertight boxes or containers, the total buoyancy of which will be sufficient to keep the vessel afloat with the holds flooded.—*International Marine Engineering*, September.

NAVIGATION AND RADIO

LAKE WASHINGTON CANAL FORMALLY OPENED.—Vast opportunities for industrial development and commercial expansion were made available for the business interests in Seattle, Wash., at the formal opening on July 4 of the Lake Washington Canal, which connects Lake Washington with Lake Union and Puget Sound. The event was marked by a marine pageant in which several thousand vessels of all classes participated, the pageant being headed by the historical polar ship *Roosevelt*, which carried Rear Admiral Robert E. Peary on his North Pole expedition.

The canal is about 8 miles in length from Puget Sound to Lake Washington, and by its completion more than 60 miles of additional water frontage are given to Seattle, thus enabling ocean-going shipping to make use of the non-tidal fresh water basins of Lake Union and Lake Washington. Besides being of benefit for commercial purposes forethought has been given to the advantages of this project for naval purposes. As the water in Lakes Washington and Union never freezes, a splendid winter anchorage is available for vessels which are generally laid up for the winter months for fitting out and overhaul.

The locks of the canal, which were opened 12 months ago, and which were described in our September, 1916, issue, are second in size only to those of the Panama Canal. The main lock, which can accommodate any ship now afloat on the Pacific, is 825 feet long, 80 feet wide and 50 feet deep. The auxiliary lock is 150 feet long, 30 feet wide and 30 feet deep. Although the construction of the canal was suggested 64 years ago, it was not until 1911 that actual work on the project was begun. The total cost of construction was about $5,000,000.—*International Marine Engineering*, September.

WIRELESS OPERATORS FOR NAVY.—Radio operators are needed for the naval communication service to meet the additional responsibilities imposed upon the service by the war. Qualified radio and telegraph operators, professional or amateur, or men who have a fair knowledge of electricity and radio telegraphy and who could soon be qualified as operators, are wanted. Promising apprentice seamen and seamen who are undergoing training at naval training stations are also being given opportunity to become radio operators.

May Join Navy or Reserve.—The radio applicant may enlist in the regular navy for four years or enroll in the naval reserve for the period of the war. If he elects the naval reserve he must volunteer for general service, however, agreeing to go wherever sent.

The navy is training radio operators at two schools, Mare Island, Cal., and Harvard University, Cambridge, Mass. Approximately 1500 pupils, men of the regular service and the reserve, are undergoing instruction at Harvard, the buildings and facilities of the institution having been put at the disposal of the navy by President Lowell. With the transfer of the regular navy radio school, formerly at the New York Navy Yard, to Harvard, the radio training activities of the service are now largely centered in Cambridge. The course is of four months' duration and embraces military drill as well as technical and other subjects. The men take their meals in Memorial Hall, the refectory erected in honor of Harvard men who fell in the Civil War, and use the Harvard gymnasium as a dormitory.

Seamen and apprentice seamen are given instruction in the rudiments of radio telegraphy at the naval training stations at Newport, R. I., Great Lakes, Ill., San Francisco, Cal., and Norfolk, Va., and at the naval camps at Philadelphia, Charleston, Mare Island, San Diego, and Puget Sound. Those who are able to receive 10 words a minute in the continental code and who show promise are transferred to Harvard for the four months' course.

The regular navy accepts enlistments under two ratings—landsman for electrician (radio) and electrician, third class (radio). For the former rating the recruit must be able to receive 25 words a minute in the Morse code or 10 words a minute in the continental and possess a foundation in radio. For the electrician rating possession of a commercial radio license and ability to pass an examination in electrical subjects are necessary. Upon acceptance the recruits are sent to the radio school for instruction.

Five Ratings Available.—Five ratings are available in the naval reserve: Landsmen for electrician (radio); electricians, third class (radio); electricians, second class (radio); electricians, first class (radio); and chief electricians (radio). Men are enrolled in the first two classes according to their ability in the Morse or the continental codes, in the other ratings according to their experience as commercial radio operators on merchant vessels, and other qualifications.

Enlistments in the navy or enrolments in the navy reserve for radio operators will be accepted at any navy recruiting station. The monthly rate of pay for radio men ranges, on the present war basis, from $32.60 for landsmen to $72 for chief electricians.—*Army and Navy Register*, 15/9.

SPIES AND WIRELESS.—How did the Germans learn of the dispatch of our troops to France? Not from secret wireless stations on our own coast, concludes the editor of *The Electrical Experimenter* (New York, September). Their operation would be too dangerous, and they would be unnecessary. Wireless was doubtless used, he believes, but it was probably operated from an enemy submarine far out at sea, having connection with the shore that could be operated more secretly than any system of wireless telegraphy. Wireless information spreads like sound; anyone can pick it up who is within "hearing." A message over a wire is like one sent through a speaking-tube; only the person at the other end can hear it. Telegraphy by wire is far more private than wireless; the only trouble is to install the wire. In this case, the editor thinks, a private portable cable could easily have been run from the wireless station at sea to some secluded spot on the coast. There may be dozens of these outfits in existence to-day—who knows? Says the paper named above:

"When Admiral Sims took his fleet to England, Berlin knew the fact four days ahead of the arrival of our ships. Again, when our first transports were sent to France, Berlin knew that too, two days before our ships reached France; hence, the flotilla of submarines lying in ambush.

"The question is, how did the enemy get the intelligence? Our officials frankly admit that they don't know. In some quarters the opinion prevails that the information was sent by mail or by wire to Mexico—in clever code, of course—and thence sent across the Atlantic over the powerful Mexico City radio plant. This may be possible, but we much doubt it.

"We can be certain that a nation that attained as high a scientific development as Germany will use subtler and surer means to convey priceless intelligence. Besides, the roundabout route through Mexico is certainly far too slow and too dangerous, all messages being closely watched by our alert officials.

"No, we must look elsewhere. An enemy usually attacks at the most vulnerable or exposed spot. Unfortunately we have thousands of such spots, namely, our endless coast-lines. On the coasts of Long Island and Maine, for instance, there are countless thousands of spots where a human being is hardly ever seen. There are hundreds of secluded little inlets and

sheltered spots from which intelligence could be sent out in a ridiculously simple manner, and perfectly safe, too, for the sender.

"No, we don't think he would be so foolish as to operate even a mediocre radio outfit, for our navy has too many ears. What, for instance, is to prevent a spy from sending messages daily to a submarine lying still some 10 or more miles off the coast? This could be accomplished by various methods. One is by means of the Fessenden underwater oscillator; 20 to 30 miles can be covered very easily. And if we don't know that this sort of thing is going on, we'll never discover the spy. And we insist once more that no man in his right senses will use a radio outfit—it is too dangerous.

"Then, again, what is to prevent an enemy submarine from bringing over an electric cable 10 or 20 miles long, unreeling it on a shallow sand bank (using a motor-boat to accomplish this), and establishing a secure terminal in one of the secluded spots on the coast. The other end, 20 miles out in the ocean, could end in a submerged buoy. The submarine then has nothing to do but to hover about that buoy, while the land operator presses his key at certain prearranged hours of the day. By means of an electromagnet inside of the buoy, the metal shell of the latter is struck, spelling out the Morse or other code signals. The sound can be muffled, of course, to such an extent that only a submarine with underwater microphones can hear the sounds over a radius of a few hundred feet.

"Then by using its own powerful radio, the submarine can send the message across the Atlantic. By radiating certain long, undamped waves, detection becomes almost impossible. For as soon as the message is sent the U-boat submerges and lies motionless for the next 24 hours if necessary.

"Now, this may or may not be the exact means how the trick is done; at any rate, we feel that the intelligence leaves by way of our coast-line—it is too vulnerable and too inviting.

"The remedy? Intensified and intelligent coast-patrols—thousands of them. Then let us sink supersensitive microphones two or three miles apart along our entire coast-line. This will do two things: First, every underwater signal could be heard, no matter where; secondly, hostile U-boats could be heard readily and accurately located.

"We owe it to our soldiers to take every precaution humanly possible. We do not wish to wait till a score of our transports have been sunk."—*The Literary Digest*, 1/9.

ENGINEERING

TWIN SCREW VERSUS SINGLE SCREW STEAMERS FOR THE EMERGENCY FLEET.—In the Hough type of wooden steamship two distinct features are incorporated which have been patented by the designer. They are, first, the use of a central longitudinal bulkhead, extending throughout the length of the ship, in conjunction with twin hatches, and second, the peculiar construction of the bottom. By extending the centerline longitudinal bulkhead through the machinery space, a twin screw arrangement of the machinery becomes necessary. The adoption of the twin screw arrangement, however, is not solely on account of the longitudinal division of the engine room, but for other reasons which will become apparent after a little consideration.

In the first place, by using twin screws, the engines are much smaller and hence the parts of the engines, being comparatively small in comparison with similar parts of engines for a single screw ship of the same power, can be manufactured in the smaller machine shops throughout the country and a larger and more rapid production of the machinery can be assured. This is not the only advantage of the twin screw arrangement, however, for in the case of partial or total disablement of one engine the vessel can continue on her voyage without assistance.

In the case of the single screw vessel built of wood, if a propeller blade is lost, the vessel is at a disadvantage. Owing to the fact that the propeller with a blade missing is out of balance, the stern bearing in a wooden ship will soon work loose and destroy the watertight sleeve and then flooding may result. To avoid this it is necessary either to run the engine dead slow or to stop. Numerous instances are on record on the Pacific coast of single screw wooden steamships which, after losing a propeller blade limping into port, have been ordered towed to the nearest port having a dry dock, in order to avoid running the main engines.

Another advantage of the twin screw arrangement is the fact that the vessel can be handled more smartly in maneuvering than a vessel with a single screw. As the speed of the vessels built for the emergency fleet does not exceed that of the submarine, a quick change of course or a zigzag course with quick turns may be of inestimable value while the vessel is in the submarine zone.

Other features of the Hough design will undoubtedly prove of value in the present emergency, but it should be understood that the vessel is not an emergency ship in the sense that it is a hastily built ship good only for a few voyages at sea. The design is thoroughly substantial and seaworthy and was evolved before the present need of an emergency fleet was developed. It has been successfully used in the construction of several seagoing steamships on the Pacific coast, entirely apart from the government emergency fleet.—*International Marine Engineering*, September.

TURBO-ELECTRIC PROPELLING MACHINERY IN UNITED STATES BATTLE CRUISERS.—In our (*Engineering*) issue of December 22, 1916, we reprinted a paper on "Alquist Gearing for Ship Propulsion," read by Mr. W. L. R. Emmett before the American Society of Naval Architects and Marine Engineers in New York. The discussion on this paper has now come to hand, and in the discussion particulars were asked as to the reasons why the American Navy had adopted the electric drive for some of their latest battleships instead of the turbine drive. In his reply Mr. Emmett gave the following explanation, which forms part of an article he has recently written upon the subject.

The writer has for many years actively advocated electric drive for the larger vessels of the United States Navy, and as a result of a long campaign of designing, experimenting and educational activity this method has been adopted on a large scale by the United States Navy Department. Electric propelling machinery has been ordered for the last seven battleships which have been authorized, and is specified for the four new battle cruisers which form part of the present naval program. These battleships are very large and important vessels, requiring 33,000 horsepower each, and the battle cruisers involve the most stupendous propulsion problem ever presented, since they require not less than 180,000 horsepower each. Only two or three of our cities use as much electricity as will be generated on one of these ships when she makes her full speed of 35 knots.

Electric propulsion has from the first had many opponents, and it is still being very actively opposed by nearly all the shipbuilders of the country, by Sir Charles Parsons, Mr. Charles Curtis, and others who have had important influence in marine engineering. Most of this opposition is undoubtedly sincere, but is not altogether disinterested, since shipbuilders want to use machinery which they know how to build, and since turbine inventors have in the past received large royalties from turbine-driven ships, which are cut off by the advent of electric drive. Although the power still comes from turbines, the electric drive is, by license agreements, free from royalty charges. The possibilities of large electrical apparatus do not appeal strongly to those who are not thoroughly familiar with its uses. Electric propelling machinery will be generally heavier and more expensive than the best developments of geared turbine machinery, and variations of opinion have rested upon the relative importance given to advantages and disadvantages.

The General Electric Company (of New York) has, under the writer's direction, also carried on extensive developments and operations in ship propulsion by turbines connected to ships' propellers by gearing. Machinery of this class for 79 large vessels has been contracted for by them, and many of these ships are in service and showing unqualified success. Our view, therefore, is not entirely one-sided, and although it may be considered that we are particularly interested in the development of the uses of electrical machinery, we believe that we have judged fairly and that our efforts will lead to important and lasting success.

In explaining the advantages of electric drive, comparisons will be made only with the geared turbine drive. All other methods for propelling large vessels may be considered obsolete, although many ships are still being built with engines or with direct-connected turbines.

A wise rule in engineering is to advocate new things only for the purpose in which they afford the greatest advantages, and this rule has been closely followed in the promotion of electric propulsion, which was originally advocated mainly for large warships. This first move was made before the use of mechanical gearing for such a purpose had been suggested, but its advantages for this particular use are so striking that it is still believed that the wonderful development of gearing possibilities have not changed the original case.

The subject of electric drive is too large for full discussion in such an article as this. Its possibilities and advantages can be best suggested by taking as an example the case of the new United States battle cruisers, in which its use has been and still is the subject of much discussion and criticism. This may be considered as the extreme case, where advantages are most important and in which the disadvantage of increased weight is most serious.

New Battle Cruisers.—Four of these vessels are authorized in the Navy Bill of 1916. They are designed to make 35 knots each, requiring 180,000 horsepower delivered to four shafts turning at full speed about 250 r. p. m. These are the fastest and most highly powered vessels ever built. The electrical installation proposed in each of them far exceeds in extent any single installation ever made for any purpose.

Apparatus Proposed.—It is proposed to install in these ships four high-speed turbine-driven generating units of the best type, similar in most respects to those used in power stations on shore. Upon each of the four propeller shafts will be mounted two independent induction motors. Cable connections and switching arrangements will be provided by which any combination of motors and generators can be immediately provided for and by which all the changes of connections for operation, reversal, etc., can be instantly made under all running conditions. The details of design and method of operation need not be described in this discussion. They are quite simple, in fact much simpler than in most electrical installations. The electric supply is produced for the one purpose of propulsion, and is varied or discontinued according to need. Connections are changed only on dead circuit, even in the ordinary operations of stopping, starting and reversing, and automatic means are provided by which any diversion of current from any cause produces an unbalancing which instantly breaks the field circuit and de-energizes the system.

The aggregate weight of this equipment, with cables, switches, instruments and controlling apparatus, is 1865 tons.

Equipment if Gear-Driven.—If such a vessel were gear-driven, a plurality of ahead turbines would be connected through helical gearing to each propeller shaft. One or more backing turbines would also be connected through the same gearing, and if good cruising economy were sought, it would be necessary to provide also cruising turbines, connected through separate means of gearing and arranged with couplings so that they could be detached during high-speed operation.

A just comparison of this method with the electric equipment proposed would require a complete design and analytical study of the geared equipment and its performances. The writer has not made such a study in the case of these vessels, therefore no exact figures can be given. The space and number of turbine elements connected to each shaft will determine the space required for turbines, and this spacing will govern the length and weight of the shafts, piping, valves and supporting structures.

In some of the installations which have been proposed abroad for vessels of much less power than these, the multiplication of parts has been very great and the size and extent of turbines and supporting structures such that the adoption of similar methods in these ships would certainly give weights nearly as great as, if not greater than, those proposed for the electric drive. Some of our shipbuilders, in bidding to the government on these vessels, have stated that by using geared equipment they could save about 1000 tons in weight and about $1,000,000 in cost, but whether these statements will bear analysis or not cannot be said without study of their detailed designs, if any have been made.

Detachment.—Without further description or discussion of either type of apparatus, we are in a position to make a comparison which constitutes one of the most important advantages of electric drives. In the geared equipment each shaft has a system of turbines, gears, bearings, thrust-balancing devices, and lubricating systems, all mechanically locked together. With high-speed machinery any kind of trouble with any of these parts will almost certainly necessitate the immediate stoppage of the whole system. To keep a high-speed turbine running out of balance or with bearing trouble is impossible, and the gearing part would present almost equal difficulty. In the event of mechanical trouble of such character, a ship would have to be stopped until the wreck could be cleared. The work necessary to uncouple and disconnect any part of such very heavy apparatus would be a serious matter, involving much time, including that required to stop the ship. After the disconnection was made the idle propeller would act as a very serious drag on a fast vessel.

In the electrically driven ship there is no mechanical connection of the shaft to anything but the rotors of motors. These are self-contained ironclad structures and cannot by any possibility be subject to mechanical interference. The shafts are subject to the same possibilities of bearing or thrust trouble as shafts in other ships, but the presence of the motors does not increase this danger, and the speed being low it is remote in any case. With this equipment any motor, generator or turbine, if in any kind of trouble, can be instantly disconnected without stopping the ship, and with only a small loss from the highest speed capacity.

Interchangeability.—Such interchangeability as this power of disconnection gives constitutes one of the most important advantages of electric drive in such a ship. With one motor out of eight in trouble, only one-eighth of the maximum capacity is lost, and the ship's maximum speed is impaired by only about 1 knot. If a generator or turbine is in trouble, the maximum speed is reduced only about 2 knots. With two generating units and four motors out the ship can make 26 knots, and with three generators and four motors out she can make 19 knots. If parts give trouble they are simply cut out and repaired at leisure or as opportunity affords. The value of this interchangeability in a warship can hardly be overestimated; it largely overcomes the military danger incident to accidents to the driving power, a danger which has always been of primary importance.

Backing Power.—In turbine-driven ships, not electric, it is necessary to provide backing turbines, which must run idle in the reverse direction when the ship is going ahead. These backing turbines involve complications which are very objectionable, and if these are reduced to a desirable minimum the backing power will be greatly inferior to that easily provided with electric drive. Experiment has shown that a turbine forced in an opposite direction involves about seven times as much friction loss as when driven

in its normal direction. This loss is very appreciable in the backing turbines of ships and causes heating, which must be dissipated by circulating steam, which causes further loss and waste. There are also serious difficulties and dangers in high-speed apparatus incident to the abrupt and wide changes of temperature where steam is suddenly admitted to a cold, reversing turbine. Steam which expands without doing work has a high temperature, and if work is done upon it by a reversed turbine the heat is considerably increased. With superheat these temperatures may be extreme, and they affect the main turbine as well as the other, since it also must be used for reversal of direction and since the two often occupy the same casing. The mechanical effect of such abrupt change of steam temperature upon fragile structures presenting very extended surfaces is a matter which has been little considered, but which has caused much serious trouble. With electric drive the turbine never need be stopped when the ship is under way, and its operation is easier than in a power station because the load is steadier. With modern high-speed turbines superheat affords large gains in fuel economy, and the ability safely to use high degrees of superheat may constitute one of the important reasons for adopting electric drive.

Efficiency of Transmission.—Various statements and estimates have been published concerning losses in high-speed gearing for which the authority is not known by the writer. Tests at Schenectady have shown losses about double those generally estimated, with rapid diminution of efficiency as load falls. These tests were of a most accurate character, with large, smooth-running gears and by the motor-generator method, where losses alone were measured, the same power being transmitted with and without the gearing.

With the electric drive in these battle cruisers, the losses from turbine to propeller shaft at full speed will amount to 7 per cent, and by adjustment of voltage the transmission efficiency can be kept equally good at all speeds. Considering gearing losses, reversing turbine losses, losses incident to necessary subdivisions of the turbine and additional packings, it is believed that the actual transmission from turbine blades to shaft at full speed cannot be made more than 2 per cent better in the geared equipment than it is in the electric. At reduced loads the geared equipment will be much less efficient. The normal cruising speed of these ships will require less than one-tenth of full load, and the drag of gearing, bearings, reversing turbines and idle parts of main turbines will be very serious. Some of these matters seem to have been ignored in statements which have recently been made on the subject.

Cruising Economy.—With the electric design the number of motors and turbines used can be adapted to the demand for power, while with the other all parts must be kept running. This gives very important gain in economy at all speeds below the maximum. At 19 knots only one turbine is required to drive the ship, and electrical arrangements are made by which it can be run at full speed instead of running at half speed, as it would if the ratio were fixed as by gearing. Thus the steam efficiency at 19 knots, a desirable cruising speed, is equal to the best attainable at any speed. Assertions which have been made by shipbuilders and others that equal cruising results can be obtained by the use of cruising turbines are obviously absurd. The cruising turbines themselves would be greatly inferior to the single main turbine so used, and they would be burdened with all the drags which are mentioned above. Cruising economy gives increased cruising radius without renewal of fuel supply. This has always been considered a matter of the greatest importance in warships; it is a feature in respect to which electric drive can have no rival.

State of Development and Expediency.—Enough has been said to give an idea of the reasons for the use of electricity in such ships, but in addition it should be considered that everything used in such an electric installation is a matter of exact knowledge and wide experience, while methods of gearing on such a scale are backed by little and brief experience and are the

subject of wide difference of opinion as to methods of design and proportions.

The writer believes that the differences of weight and cost which have been predicted by shipbuilders and others are not based upon just comparisons, but even if they are true they are not sufficient to balance the practical merits of electric drive for such vessels.

For these reasons it is believed that when prejudices are overcome electricity will develop an extensive use in large, high-power warships. In such light vessels as scouts and destroyers, for reasons of weight and space, it is relatively much less desirable, but even in such cases, with the lightest and most compact designs, and with very high pressure and superheat, it might in the future develop a legitimate application. In merchant ships also it may afford great advantages. With electricity turbine units can be installed in duplicate, either in single or twin screw ships. Machinery can be installed where convenient, with motors near propellers and turbines near boilers; auxiliaries can be driven electrically from the main units. The highest superheat can be used without danger or complication, and main units can be applied to other power uses such as cargo pumping and handling. These advantages have led to the preference of electric drive at a higher price in certain large freighters recently ordered, and will doubtless lead to many other applications in ships of various types.—*Engineering*, 24/8.

NEW SPECIFICATIONS FOR STEEL CASTINGS.—New specifications governing the manufacture of steel castings have recently been issued by the United States Navy Department, says *The Iron Age*. The chemical and physical properties demanded by those specifications are as follows:

Grade.	Chemical Composition. Not Over		Physical Requirements.				
	P.	S.	Minimum Tensile Strength.	Minimum Yield-Point.	Minimum Elongation. Per cent in 2 inches.	Minimum Reduction of Area.	Bending Tests. Cold Bend. Not less than
			lbs. per sq. in.	lbs. per sq. in.		p. c.	deg.
F.	0.05	0.05	85,000	53,000	22	35	120
A.	0.05	0.05	80,000	45 per cent of tensile strength obtained	17	20	90
B.	0.05	0.05	70,000		22	30	120
D.	0.06	0.05	60,000		22	30	120
C.	0.06	0.07	—	—	—	—	—

(about an inner diam. of 1 in.)

NOTE.—Class F castings may contain nickel or other alloying metals.

Grade C castings are not tested and are regarded as the least important. The purpose for which each grade is used is given in the following paragraphs from the specifications:

Grade A is intended for all important parts subject to crushing stresses or surface wear only, such as hawse pipes, chain pipes, turret roller paths, engine guides, stoppers, etc.

Grade B is intended for parts subject to tensile or vibratory stresses, such as stems, sternposts, stern tubes, rudder frames, struts, engine bedplates,

cylinders, gun-mount stands, carriages, slides, and other parts subject to the shock of recoil.

Grade C is intended for gun mounts, such as brackets, levers, wheels, etc., not subject to shock of recoil, and for commercial fittings, where structural strength and separation of watertight compartments are not involved, such as pipe flanges (other than bulkhead and deck), cagemast fittings, stowage lugs and clips, hinges for doors and hatches where water-tightness is not involved, etc.

Grade D is intended for the same general purposes as Grade B, but where greater strength is required with equal ductility.

Grade F is intended for castings for gun yokes, gun-mount stands, carriage slides, deck lugs, etc., of large size.

The latest specifications of the navy for structural steel work, dated February 1, 1917, demand not over 0.05 per cent of sulphur and phosphorus in all steel castings used in yards and docks and similar work, and limit the sulphur to 0.045 per cent for rivet steel for bridges and buildings.

It is known that in many cases it is difficult to meet a sulphur specification of not over 0.05 per cent at present, even in acid open-hearth work. The intensive stress for output under which blast-furnaces and coke plants have had to operate has tended to increase rather than diminish the quantity of sulphur in the raw materials, thereby making it still more difficult for steel makers to meet specifications.—*Engineering*, 10/8.

AERONAUTICS

THE WORLD'S AIR ROUTES AND THEIR REGULATIONS.*—The following article by Col. Lord Montagu, of Beaulieu, C. S. I., F. R. Met. Soc., A. I. M. E., Advising Mechanical Inspector to the Government of India, appeared in *Aviation*, 1/9:

"Unless we are to have lawlessness and anarchy in the regions of the air there must be efficient control—this is an axiom of efficiency and civilization. Control of the levels can only be exercised, nationally and internationally, by police pilots on fast planes above the ordinary traffic, where, with the forces of gravity to aid, they can descend with a superior swiftness upon malefactors and breakers of the laws of the air, take their numbers or compel them to alight at the nearest landing place or drome.

"There must also be no unsilenced machines regularly operating below 8000 feet—I am not sure whether that limit is high enough—for even above that height the noise of many open exhausts and the hum of many propellers may become a continuous and nerve-racking nuisance A serious amount of unpopularity and agitation against the use of unsilenced planes will have to be faced before long.

"Now we come to the levels above 10,000 feet, which I propose should be internationalized. The upper air should, I think, be free to all, under certain regulations, provided pilots comply with certain rules for meeting and overtaking, and their craft passed as air-worthy—let us say, registered as A1 in a Lloyd's aerial register. This would follow the precedent, which has worked well, of the 3-mile limit at sea open to all ships of all nations.

"Great altitudes will impose upon ordinary flying some disadvantages which will tend to keep international flying overland and oversea near the 10,000-foot limit, and flying at these levels will probably, so far as international flying is concerned, be conducted along routes to be defined by methods to which I will allude presently, and in some cases nations may agree to admit international traffic to their own levels. But if a particularly cantankerous nation objects to admit any traffic to the lower levels below 10,000 feet, the air routes will not be altogether barred.

* Extracts from a paper read before the Aeronautical Society of Great Britain, June 21, 1917.

"It is clear, also, that there will be prohibited areas, naval and military centers, and flying over thickly populated districts will probably be avoided on account of a certain risk to those who are still content to crawl about on the earth. But, of course, this will not preclude, as I have said, the air liners of different countries using the lower levels when necessary, under license from the countries over which they pass. Then, postal and passenger services may sometimes be driven down to lower levels owing to stress of weather.

"Aircraft desiring to leave their own levels will, of course, use their wireless to ask for permission from national or international flying authorities. But in this case they should conform, at least so I think, to the rules for silence and any other restrictions which may be found necessary in the lower levels to ensure the peaceful enjoyment of the earth's surface by its inhabitants. The problem of how to secure law and order on over-sea routes is more difficult, and for this purpose it seems to me that we shall have eventually to define the paths to be followed within, say, certain degrees of latitude and longitude.

"It is here again that international control will be necessary, and this control must be backed by international force in the shape of air police, for without force behind them conventions and international arrangements are as futile as the resolutions of The Hague Convention have proved to be. It may be, therefore, that flying over the sea outside the 3-mile limit will become a question of routes outward and homeward, with no exactly defined air levels or a fewer number of levels.

"I now come to the question of how the routes chosen over continents are to be defined and traffic guided by night and by day; also how landing places are to be constructed and defined. Here, again, I think we may follow the long and proved experience of the sea. It happens that we possess a more or less agreed code of buoys and marks for defining channels, which I suggest should be imitated in the matter of the air. On the right hand, or starboard, side of all routes from the west to east, the direction in which the earth turns, there should be round marks—a white ring containing a black center.

"Routes emanating from westerly points would be those whose general trend is between north and south on the westerly side of the compass. To take, for example, the routes from America to Ireland, Great Britain to Russia or India, Japan to Alaska or British Columbia, Brazil to the West Coast of Africa—on these the starboard, or right-hand, marks on land and sea alike will be white circles with a black center, while on the left, or port, side would be checker marks as shown here, square in shape.

"At sea a system of large buoys may be necessary, where the depth of the sea is not too great for anchorages. And these marks, I may observe, will have to be of considerable size, probably at least 100 yards in diameter, for at 10,000 feet these will appear mere dots on the earth's surface.

"At night routes may be defined, as you see on these diagrams, by a continuous white light on the right, or starboard, side, and red and white alternating lights on the left, or port, side. These international and national routes, between countries, parts of a country, and continents should be of a minimum width of 5 miles, and in some cases a space of 10 miles may be a more suitable width when the air eventually becomes crowded. But that time is some way off.

"Dromes and landing places may have to be convex and circular, on the plan shown in the diagram. The advantage of this will be that every air-plane alighting will have, running uphill, the force of gravity to arrest its motion, and when starting off again, the force of gravity will equally help to give it speed to rise from the ground.

"At night the principal light which will illuminate these special places will, of course, show its rays up wind, so that the pilot who is obliged to land against wind will have the light at his back and not in his face when making his landing. There must also be lights denoting the starboard

and port sides, smaller green and red lights on each side of the portion of the ground on which landing is advisable.

"All these lights should be movable, and be placed on trucks on rails laid down round the circumference of the landing ground, so that they can be moved as the wind shifts from one quarter to another, and in the daytime they can be used in conjunction with indication marks to achieve the same purpose. Different routes would be indicated by large white arrows on the ground with, perhaps, the initial letter E or G to say in which direction the routes were proceeded. At night such arrows would be illuminated.

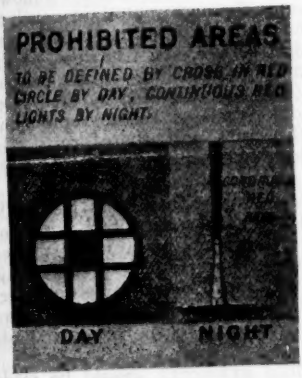


FIG. 1

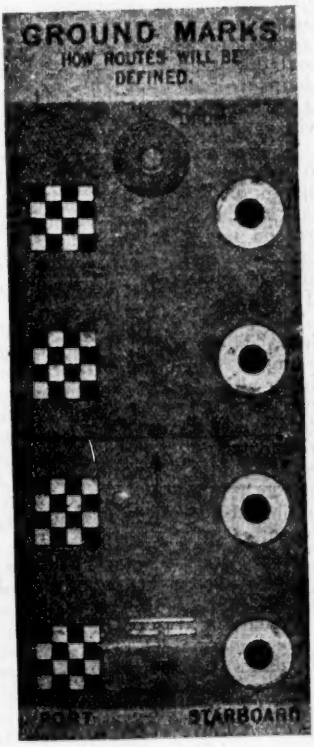


FIG. 2

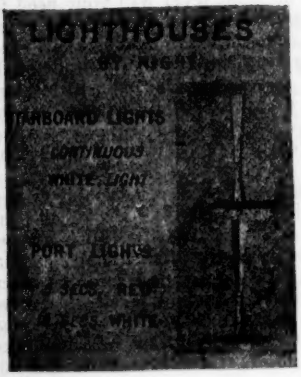


FIG. 3

"The marks and lighthouses could be at intervals of 10 miles alternately each side, or 20 miles apart on the same side, as shown on the diagram, and in the case of fogs these lighthouses will help, like those concerned in navigation by sea, with wireless telegraphy and toned fog-horns. There will also be assistance given by at least two new and very recent developments of wireless telegraphy, by which direction of bodies in motion can be accurately ascertained by the helmsmen or pilots and their position in regard to fixed points on sea, land, or in the air easily ascertained. I cannot give any more precise indications at present of these new developments,

which promise to be of the greatest assistance in the navigation of the air in the future. In fact, when perfected they will deprive night fog and cloud of most of their dangers.

"Over the sea lightships will be usable with the same code of lights always turned upwards. There may also be on land small captive balloons at moderate altitudes illuminated at night to indicate locality to the upper levels.

"*Gradient Pointers.*—Now we come to some minor, but still important points, such as to how mountains are to be surmounted. You will remember that I expressly mentioned that the 'levels' should be measured from the surface of the planet, not from the sea-level calculations. It follows, therefore, that when you have to cross passes through mountains, such as the Himalayas, Alps, Pyrenees, or, to come nearer home, to fly over such mere pimples in comparison as the Pennine Range, the Cheviots, or the Grampians, there will have to be some signs to show that you are nearing 'rocks.' Of course, to save motor spirit (probably distilled by then from coal direct, and no longer petrol), the lowest passes through mountain chains will be selected. The world's traffic lanes will, therefore, not be at the same altitude all over the world, reckoning from the sea-level. They will vary except over flat countries.

"Let us take an instance near home: the nearest route from Newcastle to Edinburgh—over Carter Fell into Scotland—will necessitate a rise of just under 1600 feet. Without proper warning and on a misty day or dark night, an airplane flying to the east of the point where the border is crossed might collide with the Great Cheviot, which is nearly 3000 feet high, or nearly touch Carter Fell itself to the west of the pass. There must be, therefore, indications of gradients similar to the gradient posts of railways.

"I propose that ascending and descending gradients should be made clear. These would be white patches by day and their outlines illuminated by night. Then you may legitimately ask at what level will your need for higher altitudes for your levels begin. I suggest that all altitudes from sea-level to 250 feet should be considered as negligible. Above that, every 250 feet will be indicated by large figures giving the average altitude of the ground below, 500, 750, 1000, and so on. It will be desirable, in planning regular routes, to avoid isolated high hills or groups of hills, small in area, such as Hindhead or the Malvern Hills. All routes will follow so far as possible flat country for meteorological reasons as well, as I shall show presently.

"*How Aircraft Should Be Made Identifiable.*—Now I come to the problem of how planes shall be designated and made identifiable. First of all there will be the nationally arranged colors of each country for those engaged in official services. Then I propose that all private planes shall be white and commercial planes red to distinguish them the one from the other. All planes, official and private, will be lettered and numbered, as decided by some international conference, such as that which settled for all countries the regulations for international motor car touring, and which allotted to each country specified lettering—GB standing for Great Britain, F for France, and D for Germany.

"Pilot certificates granted by responsible countries will be recognized as valid by all those countries which signify their adherence to an international agreement, in the same way as motor drivers' licenses are now recognized everywhere.

"Almost the most important of the subjects which will have to be considered in relation to the world's air routes is how weather and wind conditions will affect flying over the surface of this planet. The prevalence of trade winds is known to you all, and how they blow with unvarying regularity and strength in certain directions in certain seasons. But what is less generally known is the almost permanent existence of areas of high barometric pressure (sometimes called anti-cyclonic systems) in

different parts of the world. These systems, though they contract and expand, have a more or less continuous effect upon the weather and winds of the world.

"*Wind and Weather All-important.*—Before these charts of pressure and winds can be properly understood, there are two points that must be grasped. Firstly, that wind always blows parallel to the lines of the isobars, that is, the lines of equal pressure, and, secondly, that the circulation of the wind is clock-wise in high pressure or anti-cyclonic areas and anti-clock-wise in low pressure or cyclonic areas. This is known as the Buys Ballot Law, which in the southern hemisphere equally applies in an opposite sense.

"Now you will observe that the weather of western Europe, with which we are mostly concerned, is largely governed by two factors, the tendency to a low pressure trough more or less, all the year round, between Greenland and Iceland, and the high pressure area, which is permanent, though varying in area near the Azores. There is another seasonal high pressure area in the Sahara over North Africa, between the West Coast and the Sudan, during the winter time, as has just been proved by Major Lyons, the president of the Royal Meteorological Society, in a recent paper. Then there is a nearly constant area of high pressure north of the Himalayas, over southern Siberia and Turkestan.

"The low pressure systems in the European and western Asian areas are more seasonal and variable in character. There is a trough of low pressure, which lies between the Persian Gulf and the Western Himalayas, between May and October, which is the origin of the southwest monsoon so strongly felt in the Arabian Sea and over the western and northern parts of India. Then, nearer home, there is another area of low pressure generally prevalent over the Adriatic, the northern Mediterranean and the Balkan States, which is characteristic rather of the winter than the summer months, producing a tendency to westerly winds in the Mediterranean and corresponding easterly winds to the northward of the Carpathians.

"Now the systems, and the consequent tendencies to a permanent direction of wind either all the year round or at certain well-defined seasons, have a most important bearing on the world's air routes. For instance, the route homeward from India during the greater part of the year will be far easier through Afghanistan, Russia, Germany, and by what I may call the northern route, than by a more southern course, for easterly winds or calms predominate. On the outward or eastward journey, however, the route is across France, by the Rhone Valley, where the wind is often northwesterly, sometimes called the 'mistral,' to Marseilles, whence we shall go either across the lower Alps to Italy, and follow the coast to the heel of Italy. Or we shall fly via Sardinia to Malta, whence by Tunis we get to Egypt.

"The alternative routes will be from Brindisi to Alexandria direct about 900 miles, or from Taranto to Malta. Thus the eastward and westward routes to India, the central European and Mediterranean, may be spread apart by a thousand miles at their extreme points of divergence, and yet be the quickest routes and the cheapest to fly. In fact, wind will matter far more than mileage.

"*Eastern Routes as Affected by Winds.*—Now let us take the outward eastern route in detail and see how the winds will help on an average winter day. Starting, say, from Hendon or, perhaps, Croydon—for I assume that two great starting and landing places will exist for northern and southern routes to and from London—in the first flight Marseilles will be reached, where a descent for lunch will be made, the 600 miles—I give round figures—having been covered in about five to six hours. This portion of the route will be affected on about 80 per cent of the days of the year, first by westerly and later by northwesterly winds, that is, either cross or negative and favorable currents.

"Next, some point near Taranto or Brindisi or at Malta itself will be the next stopping place. This part of the journey will probably be done by seaplane in order to avoid the longer route round the Bay of Genoa and the leg of Italy. The prevailing wind over this section will be northwest to start with, and afterward light airs from the southwestward will be encountered. The 'mistral' often extends in a modified form on many days in winter to a point as far as the south end of Sardinia, where the more westerly current supersedes it. The winds on the first day will, therefore, be favorable on the average.

"*Second Day's Journey.*—On the second day, whether we start from Brindisi for Alexandria direct or fly via Malta and Tunis or Tripoli, a westerly wind will prevail, as a rule, near the African coast, though a moderate easterly wind is sometimes met with in the neighborhood of Malta from September to April.

"On this second day's journey, by evening you will have reached either some point between Malta and Alexandria on the Tripoli coast, or more likely Alexandria itself, only 850 miles from Malta. Egypt is situated in a region where calms or light winds predominate, with the exception of the disagreeable sand-laden 'Khamseen,' the strong westerly wind from the desert, which, however, is favorable to progress eastward.

"We then proceed eastward over the Arabian desert, where calms and light winds are the rule, a state of atmosphere which prevails all the way to Karachi, except in the monsoon period, when the northwest wind is also in our favor. In the Persian Gulf the isobars for the greater part of the year show a prevalence of northwesterly currents, also favorable. At Karachi in the winter, during the day, wind of considerable strength from the southwest is produced by the great difference of temperature between the Arabian Sea and the heated areas of the Sind desert behind it. Flying on southeastward toward Bombay or northeastward toward Delhi, there is no decided unfavorable current on the average.

"*Reverse Winds for Home Passage.*—I have not time to examine in detail all possible routes, but on the homeward passage, the reverse side of these winds, favorable for flying eastward, is available. There is no doubt about the prevalence of easterly and southeasterly winds throughout the monsoon period, lasting from the middle of May to the end of October, in all the country we should use for our westward journeys through Afghanistan and through the neighborhood of the Aral and Caspian seas.

"Our first day's journey homeward takes us to Gurieff, following the average isobars. And once the corner of the Hindu Kush has been crossed at about 5800 feet, the country all the way to England is marvelously flat, which favors the absence of wind.

"The next day we leave the head of the Caspian Sea, and arrive via Lugansk at Tarnopol near Lemberg. Here, again, we leave the mountain systems of the Caucasus, the Balkans, and the Carpathians to the south of our route. The next and third day we have to face the chances of westerly winds against us when approaching the North Sea and Channel, which, however, lose much of their force inland.

"*The Wind Our Friend.*—Of course, there will be special atmospheric conditions from time to time which will involve alteration from the average courses recommended for over-sea and over-continental flying. There may be, to take a common instance in summer, an extensive 'low' over France or over the mouth of the Channel, involving strong easterly winds blowing from our western shores far out into the Atlantic to a point at which the Azores 'high' is joined up with another 'high' near the Atlantic coast.

"In such a case a seaplane could, with the probability of a favorable wind over the greater part of the passage, fly from County Kerry to St. John's, Newfoundland, in a shorter time and with less expenditure of petrol than by any other route. And in flying westward you will be sun-chasing.

"In our English latitudes of 51 to 55, the earth's motion does not exceed about 650 miles an hour, and though we shall not be able to fly quite fast enough yet round the planet to keep the sun over our heads continuously, still at 120 miles an hour we shall lengthen our day very considerably.

"In the case of crossing the Atlantic there will be a gain of about four hours between Ireland and Newfoundland, which means that leaving Ireland at 7 a. m. on a summer morning, if an average of 110 miles an hour is maintained, you will reach St. John's in 16½ hours, actually elapsed time, from which four hours must be deducted in point of solar time. Thus you will leave Ireland after breakfast at 7 a. m. and reach Newfoundland at 7.30 p. m., by local time in time for dinner. Coming eastward, your daylight will be shortened by the same time, and, except in the summer months, a start before dawn or an arrival after sunset will be inevitable.

"I cannot deal on the present occasion with other weather conditions such as fog, except to mention that fog exists chiefly in certain latitudes and generally coincides with calm weather, or, at any rate, very light winds.

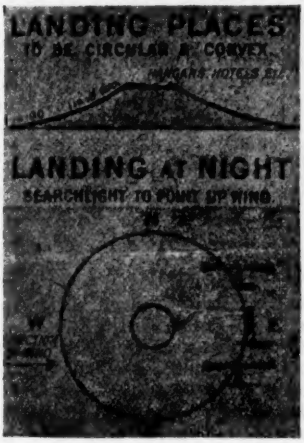


FIG. 4

Rain, snow, and hail I disregard, for they will be negligible to the planes of the future, though large hailstones may be harmful to propellers or even wings; but hailstorms are local, as a rule, and can be avoided. The ability also of airplanes to avoid or rise to a height above local disturbances will be the solution of many of these difficulties, for heavy precipitation, generally speaking, arises in levels lower than 10,000 feet.

"*A General Law for Flying.*—Applying the results of the Buy Ballot Law, we arrive at another proposition, which will be accepted by meteorologists, that when the weather at any spot in the northern hemisphere is under the influence of low pressure areas, and if the passage of the centers is near the place from which the pilot is flying westward, he will start on a northerly course at first. In like manner, when he desires to fly in an easterly direction, he will take a southerly course to start with. If, on the other hand, the weather is under the influence of a high pressure area, these rules will be exactly reversed.

"There is another point which every experienced pilot is aware of but which is not generally known to the public. The higher you fly the more the wind tends to turn to the right. That is to say, if on the ground

you find a westerly wind, the wind at 5000 feet will probably be WNW, and at 10,000 feet probably NW. The cause of this is found in the rotation of the earth, but I cannot dilate on that here.

"Now I come to the conclusion of my lecture, and I desire to summarize the principal points.

"*Three Points of Importance.*—Firstly, as soon as war is over there must be national and international laws for the regulation of flying.

"Secondly, over-sea and over-continental routes must be defined in the interests of the whole world.

"Thirdly, the winds of the world, instead of being a drawback to flying over the surface of the planet, will, if properly used, prove to be of great assistance.

"*Life and Money Spent on Aviation Not Wasted.*—The progress of aviation, owing to its immense and increasing importance in the war for naval and military purposes, has been extraordinarily rapid during the last three years. The decisive military and naval results which a real preponderance of air power would bring about are at last beginning to be realized. Nations are spending millions of money upon the development of flying, and thousands of brave men have sacrificed their lives, both in fighting and experimental work. There has been a prodigal expenditure of life and treasure and a wonderful concentration of brains and energy on aviation for destroying human life and wrecking property. But when peace once more comes, this output of human life and skill will prove not unproductive. Unlike the expenditures of all kinds in producing forts, battleships, guns, shells, powder, missiles, gas and horrible and ingenious ways of killing, resulting in nothing useful to the human race in future, the forced development of aviation will, perhaps, be the war's most useful legacy."

AMERICA'S AID IN AERIAL WARFARE.—*Flying* (September) printed the following article written for the *New York Herald* by H. C. Coxe:

"A very busy man is Mr. Daniel Vincent, Minister for Aeronautics, as I perceived when I called at his office in the Boulevard St. Germain. Officers and civilians rushed past me as I waited patiently for my turn to see the chief of France's great air service. All was business—that was evident. It resembled an office in Wall street.

"There appeared to have been some kind of conference of aeronautics, for I recognized several famous 'aces' who have won distinction on the battle-field. 'They are such modest fellows,' said an officer who observed my attention fixed on these young and energetic Frenchmen who risk their lives so many times a day and night for the cause of their country. 'They treat us just as if they were our equals, ordinary soldiers,' said another. 'They are really wonderful.'

"When introduced into the office of the Minister I observed the quick eye of Mr. Vincent, his energetic movements and direct way of speaking. He is an outcome of this war in French politics. A man must be had who can do things quickly and well. Mr. Vincent is himself an expert aeronaut. That is why he gets through the business of his office so efficiently. In reply to my question whether he had a word of encouragement for our American airmen he replied:

"*America Needs No Stimulating.*—'Do you think America has any need of stimulation in this great matter? Her effort is remarkable and she has understood the necessity of aviation. No stimulation is, therefore, required. In regard to finance, America has done everything that is requisite; in regard to the industrial side of the matter she has accomplished a splendid success in organization which bids fair to bear fruit. Already much has been done. In regard to personnel we know that a great number of young men want to enter aviation. No, America is stimulating herself to perform her part in the great battles of the air.

"'I notice that figures are frequently given in connection with the aeroplane services—that is to say that at one time some people talk of 30,000 aeroplanes and at another of 40,000, and some even speak of an immense army of 100,000 aircraft. This is unwise. It is not useful at all to put into circulation by means of the press any figures showing how many aeroplanes a country has or is going to have.

"'Take the idea of 100,000 aeroplanes. It is not possible to have anything like that number, for in the first place you must have in that case as many as 200,000 or 300,000 motors, for you must have a reserve, so that all the forces of production would be absorbed in such a gigantic task. The conditions of aviation are constantly changing and so the production must be proportionate—always in proportion to requirements. To talk of great figures like 100,000 aeroplanes is only to make the enemy smile and to deceive ourselves.'

"*Practical Aeronaut Wanted.*—When asked if America would do well in having a secretary of aviation, Mr. Vincent shrugged his shoulders, saying: 'That, of course, is not one of my duties to discuss. But a chief of the aviation service gets good results in having a practical aeronaut to direct matters. You see, when a man has learned to fly he understands points not possible for him to grasp when he remains on land and studies machines in the factory. There he sees only the material, but in the air you judge how that machine goes, what faults are apparent and what good qualities are shown. Often you see at a glance what is required, which no mechanic could possibly imagine when the machine is in the shops. The practical man knows what the machine is capable of doing, and that is a great point. A flight in the air gives one an idea of the psychology of the aeroplane and of aviation. You can speak with aeronauts with confidence and understand all they say and recommend.

"'What we want now is not valor—we have all we want of that. We want knowledge of technique, development of discipline, tactics. The aeronautics service is becoming just like troops on land. These are things the American aeronaut must learn.'

"When asked how long it ought to take to make an aviator Mr. Vincent said: 'Five months are sufficient, assuming the pupil has no previous knowledge of the art. If he knows something about it to start with of course much less time would be required to turn him out a good airman.

"'In this connection do not forget that I have sent already to America 12 officers to teach the American aeronauts, and I hope the best results will follow. They will remain there as long as is necessary. It will be an encouragement to have our men among the young Americans who push forward to join the aviation ranks. But, after all, the best encouragement is example, don't you think?'"

NEW AIR ENGINE.—Secretary Baker has made the following statement in regard to the new aircraft engine:

"The 'United States aviation engine' has passed its final tests. They were successful and gratifying. The new motor, designated by the signal service as the 'Liberty Motor,' is now the main reliance of the United States in the rapid production in large numbers of high-powered battle planes for service in the war. In power, speed, serviceability and minimum weight the new engine invites comparison with the best that the European war has produced.

"I regard the invention and rapid development of this engine as one of the really big accomplishments of the United States since its entry into the war. The engine was brought about through the cooperation of more than a score of engineers, who pooled their skill and trade secrets in the war emergency, working with the encouragement of the Aircraft Production Board, the War Department and the Bureau of Standards.

"The story of the production of this engine is a remarkable one. Probably the war has produced no greater single achievement.

"One of the first problems which confronted the War Department and the Aircraft Production Board after the declaration of hostilities was to produce quickly a dependable aviation motor. Two courses were open. One was to encourage manufacturers to develop their own types; the other to bring the best of all types together and develop a standard.

"The necessity for speed and quantity production resulted in a choice of the latter course and a standard motor became our engineering objective.

"Two of the best engineers in the country, who had never before seen each other, were brought together at Washington and the problem of producing an all-American engine at the earliest possible moment was presented to them. Their first conference, on June 3, lasted from afternoon until 2.30 o'clock in the morning.

"These two engineers were figuratively locked in a room in a Washington hotel and charged with the development of an airplane motor for use by American aviators over the battle-fields of Europe.

"For five days neither man left the suite of rooms engaged for them. Consulting engineers and draftsmen from various sections of the country were brought to Washington to assist them.

"The work in the drafting room proceeded continuously day and night. Each of the two engineers in immediate charge of motor development alternately worked a 24-hour shift.

"An inspiring feature of this work was the aid rendered by consulting engineers and motor manufacturers who gave up their trade secrets under the emergency of war needs. Realizing that the new design would be a government design and no firm or individual reap selfish benefit because of its making, the motor manufacturers nevertheless practically revealed their trade secrets and made available trade processes of great commercial value. These industries have also contributed the services of approximately 200 of their best draftsmen.

"The two engineers locked together in a hotel room in this city promised the government, if given an opportunity, they would design a satisfactory engine before a working model could be brought from Europe.

"A remarkable American engine was actually produced three weeks before any model could have been brought from Europe. It was promised that this engine would be developed before the Fourth.

"Twenty-eight days after the drawings were started the engine was set up. This was on July 3.

"In order to have the engine in Washington and in actual running order at the nation's capital on Independence Day the perfected engine was sent from a western city in a special express car. The journey was made in 21 hours and four young men guarded the engine en route to Washington and personally attended its transfer from one railroad to another.

"With the need for speed as an incentive, tools for building the first engine were made even before the drawings were finished, on the assumption that they would be correct.

"Parts of the first engine were turned out at 12 different factories, located all the way from Connecticut to California. When the parts were assembled the adjustment was perfect and the performance of the engine was wonderfully gratifying. This in itself demonstrates the capabilities of American factories when put to the test, and when thoroughly organized for emergency work of this sort.

"One of the chief rules outlined at the beginning of the designing work was that no engineer should be permitted to introduce construction which had not been tried out. There was no time for theorizing. The new engine is successful because it embodies the best thought of engineering experience to date.

"Not only did this country furnish ideas through celebrated consulting engineers, but the representatives in the United States of England, France and Italy cooperated in the development of this motor.

"Thirty days after the assembling of the first engine preliminary tests justified the government in formally accepting the engine as the best aircraft engine produced in any country.

"The final tests confirmed our faith in the new motor in every degree.

"Both the flying and altitude tests of the new motor have been gratifying. One test was conducted at Pike's Peak, where the United States aviation engine performed satisfactorily at this high altitude. One of the engines in an airplane broke the American altitude record in a recent flying test.

"While it is not deemed expedient to discuss in detail the performances and mechanics of the new motor, it may be said that standardization is a chief factor in the development of the government's motor. Cylinders, pistons and every other part of the motor have been standardized.

"They may be produced rapidly and economically by a great many factories operating under government contracts. They may be rapidly assembled either by these plants or at a central assembling plant.

"The new engine amounts practically to an international model. It embodies the best there is in American engineering and the best features of European models so far as it has been possible to adapt the latter to American manufacturing methods.

"The two engineers most directly connected with the production of the United States aviation engine had before them not only the blue prints and models of the most successful engines the war has produced, but also every available American suggestion.

"Men skilled in the invention of motors, both automobile and airplane, advised these engineers, who were charged with the duty of providing rapidly and unerringly a motor which would embody every essential for war time use.

"Non-essential complexities were consistently discarded by these engineers. The result was a composite design of maximum power, minimum weight, great speed capability and adaptability to quick production.

"The standardization of parts materially simplifies the problem of repair and maintenance. Spare parts will be promptly available at all times. Even the cylinders are designed separately.

"It is possible to build the new engine in four models, ranging from 4 to 12 cylinders, and under the standardization plan now worked out an 8-cylinder or a 12-cylinder model can be made, using the same standard cylinders, pistons, valves, cam shafts, and so on.

"This will make the question of repairs back of the lines a comparatively simple matter. The parts of wrecked 8-cylinder or 12-cylinder engines will be interchangeable, and a new engine may be assembled from the parts of wrecked machines.

"The standardization of the new engine does not mean there will be no change in it during the war. There will be continuous experimentation as new types and improvements develop at the front and new ideas are born of the war emergency. If the engine can be improved it will be improved, but as the motor stands to-day it is one of wonderful success and produced under dramatic circumstances.

"Construction of the new standard engine will not interfere with the continued manufacture of other serviceable models, either European or American, which existing plants are already turning out.

"The production of the United States motor will be carried on almost entirely in a new and expanding industrial field.

"The government is sometimes asked 'Why does not the United States adopt one of the successful British or French high-powered machines and manufacture them?'

"British and French machines, as a rule, are not adapted to American manufacturing methods. They are highly specialized machines, requiring much hand work from mechanics who are in fact artisans. It would require a year or more to teach American manufacturers and their mechanics to turn out such highly specialized airplanes.

"The standardized United States aviation engine produced under government supervision is expected to solve the problem of building high class, powerful and yet comparatively delicate aviation engines by American machine methods—the same standard methods which revolutionized the automobile industry in this country.

"With the completion of final tests of the motor—tests which satisfied and gratified both expert engineers and army officers—progress already has been made toward organizing industry for the manufacture of the new machines, and deliveries will begin within a comparatively short time."—*Army and Navy Register*, 15/9.

The truth is that a motor has been adapted by Hall and Vincent, two American engineers, assisted by other American engineers, and trials indicate that this motor will be superior in some respects to motors now in use in Europe. The engine is a composite which embodies some of the fine points of the Daimler, Mercedes, Rolls-Royce, Packard, Espana-Suiza and Hall airplane motors.

The United States will proceed to build these motors in the Packard, Marmon, Ford, and other automobile plants. In the meantime the Joint Technical Board of the army and navy will determine the exact type of airplane to be adopted, whereupon the Aircraft Production Board will let contracts for their construction.

No battle planes are under construction in the United States, and the type of battle plane has not yet been definitely and finally selected.

The British airmen use the Rolls-Royce engine. The French like the Espana-Suiza, which the Germans also used for a time. The Germans now use an improved Mercedes and two other types.

The progress made in developing an engine is encouraging. There has not been equal progress in selecting a type of plane. There has been much headway made in preparing manufacturers for large orders for standardized parts. But no American should fool himself into thinking that the United States is on the eve of an easy and overwhelming air victory over Germany.

Two years hence, if things go as they are going, the hope of an air victory over Germany will be well founded.

The National Advisory Committee for Aeronautics, a body of which little is heard or seen, brought about a very odd arrangement a few months ago which may draw the attention of Congress. Two industrial concerns, inheritors of the Wright and Curtiss patents, threatened to make trouble for the government by putting in claims for royalties on all airplanes manufactured. Foreseeing the necessity of immense production, the national committee sought to reach a compromise with the claimants of valuable patent rights, although these claims have not been adjudicated by the court of last resort.

The ingenious plan was adopted of merging manufacturers and patentees in a single pool called the American Aircraft Manufacturers' Association. Practically no manufacturer can do business with the government unless he belongs to this association. To become a member he pays $1000 and obligates himself to pay $200 on every airplane he turns out. Of this $200, $165 is split between the Wright-Martin combination and the Curtiss-Burgess combination. The two combinations are bound to quit charging tribute when they have collected $2,000,000.

Two points attract attention: First, the airtight combination itself, which has all the earmarks of being a combination in violation of the Sherman anti-trust act; and second, the fact that no airplane builder in the country, not even the Wright or the Curtiss concerns, is building airplanes which even remotely resemble the Wright or Curtiss machines.

The machines under construction in this country are "secondary standard training planes," having a maximum speed of about 74 miles an hour, as against the 135- to 150-mile battle planes. These training planes are of two types, identified by the kind of control employed. Both types are evolu-

tions of planes used in Europe, and owe far more to Deperdussen, Farman and Bleriot than they owe to either Wright or Curtiss.

The contract price to the government for one type is $6500 per machine, and for the other $4500. It is common gossip in the trade that price-fixing has been far more expertly worked out by the aircraft combination than by Herbert Hoover, Harry Garfield, or any other government agent. Contractors who would dare to reduce prices below $4500 and $6500 for the respective planes would soon be in trouble with their association, according to these reports.

—*Washington Post*, 16/9.

NEW RECORD.—Captain Guilio Laurzami, an aviator in the Italian army, has established a new world's long distance flying record by flying more than 900 miles without stopping, according to a dispatch to the *Temps* from Milan. The Italian flew from Turin to Naples and return, a distance of about 920 miles as the crow flies. Captain Laurzami used a new S. I. A. machine. He left Turin at seven minutes past 10 a. m., reached Naples, flew over that city and was back in Turin at twenty minutes to 9 p. m.

The previous long distance non-stop flight record was held by Second Lieutenant Antoine Marchal, a French aviator. In June, 1916, Marchal flew from Nancy, France, to near Chelm, Russian Poland, in a Nieuport machine. The distance covered was about 807 miles. During the flight Lieutenant Marchal dropped proclamations on Berlin. He was made prisoner by the Austrians at Chelm and was interned at Salzerbach.

The American long distance, non-stop record is held by Miss Ruth Law, who flew 590 miles from Chicago to Hornell, N. Y., on November 19, 1916. Her elapsed time was five hours and forty-five minutes.—*N. Y. Herald*, 30/8.

RAIDING AIRPLANES HAVE TWO MOTORS.—The Gotha aeroplanes with which the Germans have been bombarding England are biplanes fitted with two motors, developing 450 horse-power and with two tractor propellers, according to Georges Prade, the French aviation expert. They carry three persons—the pilot, a bomb thrower and a machine gun operator. All can serve the quick firers if they are attacked, as there are three of these guns carried.

Mr. Prade, who has been watching the machines at the front, says that these machines if passing at an altitude of 13,000 feet, for instance, on the attack can return at an altitude of 20,000 feet without their bombs, their supercompressed motors giving them full power at great heights.—*N. Y. Herald*, 7/9.

AEROPLANES TO LINK SWEDEN AND GERMANY.—An Associated Press cable from London, September 9 says:

"A dispatch to the *Exchange Telegraph* from Copenhagen says reports from Stockholm are to the effect that a committee has been formed to arrange for an aeroplane route from Trelleborg, Southern Sweden, to Sassnitz, Germany.

"It is added that a Stockholm banker has offered 4,000,000 kroner ($1,000,000) towards the carrying out of the project."—*N. Y. Herald*, 10/9.

ITALIAN AERO OPERATIONS.—The new Italian offensive has evolved a series of battles that are still raging with undiminished intensity according to an official cablegram received from Rome to-day, reviewing military developments on the Italian front. The dispatch asserts that the Italian attack is still of a frontal character along the entire line, and that the enemy has been kept in doubt concerning the real objective of the Italians.

"The co-operation of the aerial service," said the message, "with the infantry and artillery has been complete and invaluable. Two hundred and sixty-one airplanes have been kept continuously in the air over the

battle areas, bombing the enemy position and using their machine guns against the Austrian troops behind the enemy lines, where they were massed and prepared to reinforce or to take the place of the troops cut down by the Italian fire.

"The airplanes flew within 230 yards of the ground. The passed over the Austrian lines, circled and returned, firing upon the Austrians from the rear with their machine guns. The aerial attacks were made by the Caproni (the largest type of battleplane), which flew very close to the earth, lighter and speedier airplanes flying higher to intercept and engage the counter-attacking enemy machines.

"The enemy were attacked by aircraft at points remote from their first lines, Austrian headquarters especially being among their objectives.

"The Italian dirigible N-10 a few hours before the infantry assault took part in the bombardment of the upper zone of the Tolmino. The action assigned to the dirigible had been very carefully planned. It bombed the slopes of a hill near the great fortress of Tolmino, where the Austrian commander of the army corps defending the fortress had massed troops, materials, and ammunition. The dirigible reached its destination in one hour's flight, the special objective being indicated by a powerful Italian searchlight. The dirigible discharged all its bombs upon the enemy concentration point, doing considerable military damage and causing tremendous confusion."

The first phases of the Italian offensive are described in the dispatch as follows:

"A very violent artillery fire was opened by the Italians on the night of the 17th from Monte Nero, extending to the Merghe, Vodil and other hills, little by little spreading over the whole line of the Isonzo.

"At first the enemy was uncertain whether an attack was to be launched, and therefore he answered feebly, but later opened a heavy fire with every caliber against the Vodice and Sabatino. The Italian bombardment continued throughout the night, destroying the enemy's barbed wire obstructions and concrete defences. The Austrians were obliged to evacuate their trenches and seek safety in shell craters. Several enemy batteries, in addition to those silenced, ceased firing because of fear of revealing their location.

"The Pontiori (engineer corps engaged in bridge making) assisted by soldiers accomplished the daring and prodigious work of constructing several bridges across the Isonzo near Anvovo. Ropes, lumber, and pontoons were transported by the men along the rocky slope of the river, the troops almost holding their breath to prevent being detected. Austrian searchlights nervously attempted to search the darkness to discover the movements and intentions of the Italians. Before dawn the first boat with an officer and soldiers crossed the river, followed by other boats and men to make fast the bridge on the opposite bank, all the while being under a terrific machine-gun fire.

"The bridges swung across, Italian battalions passed rapidly over, throwing themselves upon the ground after reaching the opposite side and remaining there until ordered to the attack. The Italian artillery continued its bombardment all the while, blinding the Austrians and forming between the Italians and the Austrian advance-line a dense smoke fog of a length of 15 miles.

"At 10 o'clock in the morning the Austrians had been driven from their first line and a long column of prisoners was heading towards the Italian rear. Panic stricken Austrians continued to come down to the Italian concentration posts. The ground was covered with Austrian dead and wounded, the latter being sent to the Italian field hospitals.

"In the meantime a no less severe attack was being launched against Monte Santo and on the hills around Gorizia, where the bombardment was an infernal vision. Several important hills were captured by the Italians. Equally terrific was the Italian advance from Gorizia to the sea, especially

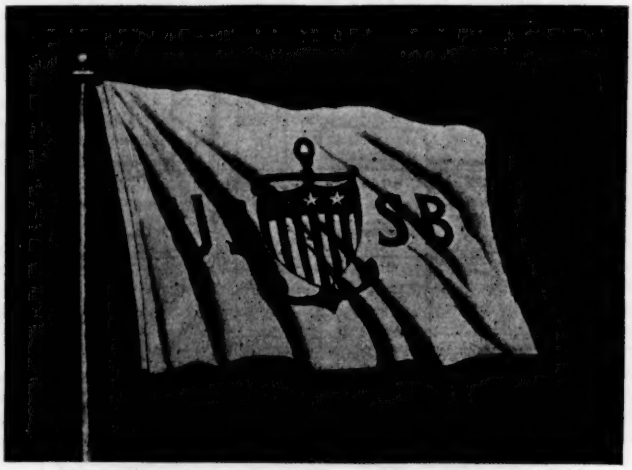
on the second day of the offensive. An uninterrupted line of infantry overcame every natural and other defence. Between Selo and Corite the Italians broke the Austrian line and succeeded in capturing the caverns where large bodies of Austrians with a great number of machine guns had concentrated.

"The battles are continuing with undiminished violence, the Austrians defending ferociously the hills and fortresses in front of Hermada, which they believe is menaced.

"The whole Austrian first line between Timavo and Flondar is bent. All attempts of the Austrians at counter-attacks have cost them heavily without securing any results. The first two days of the offensive cost the Austrians 30,000 men in dead, wounded and prisoners."—*N. Y. Times*, 26/8.

MERCHANT MARINE

HOUSE FLAG FOR THE U. S. SHIPPING BOARD.—A new house flag will soon appear on the seas, that of the U. S. Shipping Board, the body created by act of Congress last September, and organized in January, 1917, to create

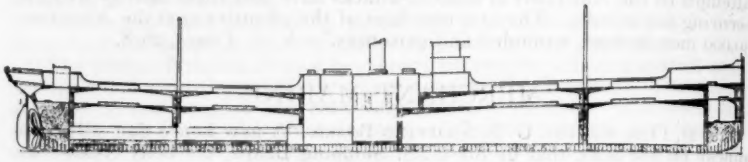


HOUSE FLAG OF THE U. S. SHIPPING BOARD

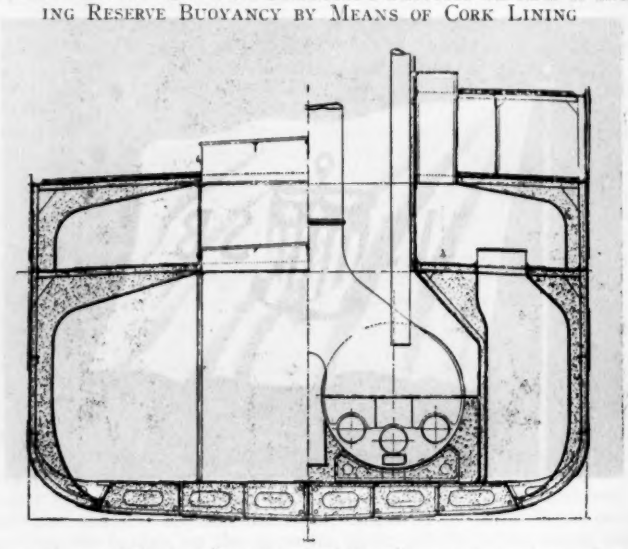
a national merchant fleet. The Shipping Board is building a fleet of 1000 cargo-carrying ships and is commandeering more than 2,000,000 tons of shipping now on the stocks in private yards, besides fitting out the 600,000 tons of German shipping that sought shelter in American ports when the war began, among these ships being the great 54,000-ton *Vaterland*. Each of the 1000 new vessels being built for the Shipping Board will fly the new house flag. So will nearly 300 vessels taken over from private owners. Furthermore, the flag will be hoisted on all the 89 German ships seized by this government on the declaration of war, with the exception of less than 20 taken over by the Navy Department for use as transports. The house flag of the Shipping Board shows on a white ground the national shield in full colors of red, white and blue, supported by a blue anchor, and flanked on the left by the letters, "U. S.," and on the right, "S. B." The proportions of the flag, in the size to be flown by a ship of 8000 tons are are 6 feet hoist to 9 feet fly. The flag was designed by Charles Collens, a Boston architect and designer. Mr. Collens made several sketches, showing

different designs, and with them enlisted the interest of Henry Howard, the Shipping Board's Director of Recruiting, whose headquarters are at the Boston Custom House. Mr. Howard took the designs to Washington and placed them before the Board, which adopted the one shown here.—*Shipping Illustrated*, 1/9.

INCREASING SHIPS' RESERVE BUOYANCY.—According to reports from Washington, the Committee on Ship Protection of the U. S. Shipping Board, headed by Admiral H. H. Rousseau, is making progress in its study



LONGITUDINAL SECTION SHOWING PIERROTET'S PROPOSED METHOD OF INCREASING RESERVE BUOYANCY BY MEANS OF CORK LINING



CROSS-SECTION SHOWING PIERROTET'S PROPOSED METHOD OF INTERNAL SHIP PROTECTION

of means to safeguard ships from destruction by submarines. The conclusion seems to have been reached that more can be accomplished by increasing the reserve buoyancy of ships than by looking for means to divert the tremendous force of the torpedo aimed at the side of a ship. One of the methods of making ships unsinkable through increase of their reserve buoyancy is that suggested by an Italian, Sig. A. Pierrotet, whose proposal is illustrated in the annexed diagrams. Briefly, his method consists in lining all the available superficial parts of the interior of a ship with a light substance such as cork. For instance, a steamer—a two-deck cargo boat—about 395 feet long and the usual lines, with a displacement of about 11,500 tons fully loaded, carries about 8000 tons deadweight, and has about 423,000 cubic feet of space available for cargo and bunkers under the main

deck. In order to render this vessel unsinkable it would be necessary to line the vessel internally with about 211,000 cubic feet of cork composition, having a specific weight of about 441 pounds to each 35 cubic feet. Writing in *La Marina Mercantile Italiana* (Genoa), Sig. Pierrotet estimates that lining a ship according to his scheme would cost, at present prices, about $200,000, while the capacity of a ship of the dimensions given above would be decreased by 1200 tons deadweight. The immediate objection that will come to mind when studying the scheme of protection proposed by Sig. Pierrotet, is that it is no easy matter at present to find cork in sufficient quantity to line ships according to his ideas. However, practicability and expediency are about the last factors which enter the minds of those who propose by empirical means to safeguard ships against sinking after they have been struck by the deadly weapon known as a torpedo, against which nearly all schemes of protection adopted in the case of warships—which, be it noted, are not handicapped in the matter of internal subdivision by the necessity of reserving large compartments free from obstruction for the stowage of cargo—have proved illusory, as is well demonstrated by the few instances on record of ships remaining for any length of time afloat after being struck in a vital spot by a well-aimed torpedo. Still less commendable is the scheme which has also been before the Committee on Ship Protection, namely, that which has in view the possibility of increasing reserve buoyancy by placing small watertight boxes in large numbers within the hull of a vessel and of distributing them in such a way as to interfere very little, if at all, with the cargo capacity of the ship. The principle of the method proposed is that the aggregate floating capacity of the boxes will be sufficient to support the vessel and cargo after the hull is torn by a torpedo. It is understood that the committee has made a number of recommendations. One of these is in regard to the painting of hulls to render them less visible. Another concerns the reinforcing of the hull covering the vital portions of a ship. Other recommendations have to do with maneuvering within the war zone. One of the effects of the committee's labors has been the issuance of an order by the Bureau of War Risk Insurance that all steamers bound for the war zone must either be fitted with approved systems for preventing the emission of smoke from their stacks or carry smokeless fuel sufficient for at least two daylight periods. Each ship must have at least one dozen smoke screen boxes on deck, and each must be painted in accordance with one of the plans recommended by the chairman of the Naval Consulting Board, 11 Broadway, New York, besides being armed. An extra premium of one-half per cent for each voyage will be charged when vessels are not certified as complying with the rules for protection outlined by the Board.—*Shipping Illustrated*, 1/9.

BRITISH COMMENT UPON AMERICAN SHIPPING.—Since the war started 37,000,000*l.* of new capital has been invested in United States shipping enterprise; a federal shipping board has been appointed, under the terms of the Ship Purchase Act, which was passed by Congress last session, and has been authorized to raise capital stock up to 30,000,000*l.* to acquire and operate ships, whilst a proposal is before the House of Representatives for the expenditure of 150,000,000*l.* for the construction of merchant vessels; more than 1,000,000*l.* has been voted for improvements and additions at the navy yards. Tens of millions of new capital are being invested in private shipyards.

This great boom in American shipbuilding and its twin industry, shipping, is of more than temporary and more than ordinary interest. It may be that, after the war, the United States instead of Germany will be our chief rival in the shipbuilding and ocean-carrying trades, as that country was in the first half of the nineteenth century. The Americans are playing a highly welcome part in helping to make good the shipping losses due to the German submarines, and in helping to combat the submarine menace. But the great activity in American shipbuilding is something more than a creation of the

war. Certainly it has been accelerated by the war; but it is part of a national movement, inaugurated before this world upheaval, to revive permanently the shipping and shipbuilding trades of the United States. A vast avenue of international trading and competitive possibilities is opened out by American shipping legislation and enterprise, coupled with the opening of the Panama Canal—assuming that the new waterway proves safe and successful.

American shipping has had two generations of progress, followed by two generations of retrogression. Now history seems to be repeating itself. The trade seems to be taking another new lease of life. Between 1790 and 1850 American shipping was raised from a very low to a very high position. In the 'fifties of the last century the American flag was in every port, and United States builders launched 50 per cent more new tonnage than we did. It was not, indeed, until the 'seventies that Great Britain built as large a tonnage in a year as the United States built in the 'fifties. The first Federal Government, in its first act for the protection of home industries, enacted a special set of laws, dues and customs designed to foster shipping and shipbuilding. At that time the situation relatively was pretty much the same as it has been in recent years. In 1790 the gross tonnage of United States ocean-going shipping was only 123,000 tons. Of the imports and exports 90 per cent was carried in foreign vessels—80 per cent in British ships. But under the laws enacted in 1789 United States shipping grew to a tonnage of 1,000,000 tons by 1820, and the proportion of the country's commerce carried in home vessels reached 90 per cent. British and other foreign ships were squeezed out of American trade as fast as American ships could be launched. The shipping favors were continued—variously in the form of subsidies for home vessels or home shipbuilding, discriminatory customs tariffs and harbor dues against foreign vessels—and by 1855 United States ocean tonnage reached 2,500,000 tons.

In the 'fifties, however, the American agricultural interests set up a vigorous opposition to the shipping subsidies, and by 1862 all the favors were withdrawn, and the shipping trade of the United States was left to compete with the world unaided. A decline at once commenced, and by 1910 the United States ocean-going tonnage had shrunk to 1,000,000 tons, against Britain's 15,000,000 tons and Germany's 4,000,000 tons. That was in spite of a huge growth in the population and commerce of the United States. In the last 12 months before the European War only 8 per cent of American external commerce was carried in American ships. The substitution of iron and steel for wood in shipbuilding was, of course, one factor in the decline of American shipping. The United States is exceedingly rich in iron ore and coal, and its iron and steel producing capacity is now bigger than that of Britain and Germany put together; but when it comes to shipbuilding, our American rivals labor under marked disadvantages. Their ore is deposited 1000 miles from their coalfields; their steel works, on account of the coal, are between 400 miles and 500 miles from seaboard, whilst their wages are extravagant for only moderately skilled workmen. The latter point, of course, is due to the abnormally high standard of living and the keen demand for labor, consequent on the phenomenal industrial development of the United States internally. The chief factor, however, in the decline of American shipping since the middle of the last century was the withdrawal of the subsidies and other favors just mentioned.

For several years there has been a steady agitation in America for more ships. About 20 years ago a Merchant Marine League was formed to advocate a revival of United States' shipping. Several shipping measures were introduced from time to time, but none of them passed, though Congress' votes showed a steady growth in favor of the "more ships" movement. However, the almost simultaneous opening of the Panama Canal and the outbreak of the world war have combined to bring this question right into the forefront of American politics. The United States Government carried a notable measure entitled the Ship Registry Act in 1914, which

permitted, on certain terms, the transference of foreign-built vessels to the American flag; and last year it enacted what is still called the Ship Purchase Bill, providing for the appointment of the Federal Shipping Board, above mentioned, and the acquisition and operation of merchant ships by the government, whilst further measures are promised. The confidence that is felt in the permanency of the American shipping revival is evidenced by the large amounts of new capital that are being invested both in shipbuilding yards and ships. When the war broke out the tonnage of United States shipping engaged in foreign trade was only, in round figures, 1,000,000 tons gross. An interesting feature of current development is the revival of wood as a building material, partly on account of the famine price of steel, and partly in consideration of the urgent demand for rapid construction. At the beginning of the year 161 wooden vessels of 500 tons gross or more were being built, or were under contract, in the United States. But that this revival of wood is likely to be permanent is more than doubtful.

Whether the general revival will be more than temporary—whether it will outlast the war conditions—is a question of open controversy. Much will depend upon the measure of state support, or protection, the United States Government will give shipping to enable it to compete with countries that have cheaper building resources and cheaper seamen than America can ever hope to have. Much, also, will depend upon the attitude and policy of our British workmen, engineers and statesmen. If our trade unionists are unreasonable after the war, if our engineers will not adopt standardization and other economical methods, and if our statesmen will not give enterprise and industry the best possible consideration, then there will be nothing to prevent such a growth of American shipping and shipbuilding, and such a decline of the British trades, as will eventually transfer supremacy in these lines from this country to the United States. On the other hand, we hold such unique advantages—with our coal and iron supplies, our steel works and shipbuilding yards and shipping ports all practically side by side, and with our huge building capacity and inherent skill—that we ought, without much difficulty, to hold our own against any possible competitor. This brings us to the root question of competition—the question of cost. The whole problem resolves itself into one of cost. The country that can produce and work ships the most cheaply will get the most trade.

How formidable the task of resuscitating American shipping will prove—or would have proved, but for the war—may be gathered from the fact that, according to the calculations of the National Trade Convention, a tramp steamer costing 66,000*l.* in England in 1913, would have cost 138,000*l.* in the United States, whilst the expense of sailing was 80*l.* per month for wages, and 20*l.* for stores, food, etc., in favor of the British flag. Such examples as the following are given: SS. *Aztec*, gross tonnage 3508, operating between San Francisco and Hong Kong (United States flag, total monthly wages $2695; SS. *Canterbury* (British), 3508 tons, operating between London and the Pacific Coast, monthly wages $901; SS. *Titania* (Norwegian), 3613 tons, operating as a tramp on the Pacific Ocean, monthly wages $614. It was pointed out that American vessels of more than 1000 tons must carry a third mate whether they needed him or not, and must have four quartermasters, although English ships carried only two and let seamen stand the other watches; that American ships must carry four licensed engineers, whilst most foreign vessels carried only three, the donkeyman standing the other watch. American ships require three water-tenders, a rating unknown on foreign vessels, and a large number of ordinary seamen, whilst there were enormous differences in the wage scales.

At the National Foreign Trade Council Convention this year, estimates were submitted showing that the average wages in shipbuilding in Great Britain were 50 per cent less, and the net output per worker 14 per cent higher than in American yards. Mr. J. W. Powell, President of the Fore River Shipbuilding Corporation, contended that in spite of the vast capital expenditure devoted to the improvement of American shipbuilding plants

during the past three years, which was believed to have placed them in the front rank from the point of view of equipment, no superiority of design or methods of building could overcome the basic disadvantages of the American industry. Only legislative enactments could enable the United States to compete successfully under peace conditions with other nations, in view of the cost of materials and labor.

Other high American authorities hold different views. The capital that is being risked in American shipping and shipbuilding is proof of the confidence felt in the future. It is believed that on the one hand the United States Government will grant such generous assistance by way of subsidies or other measures, whilst on the other hand the war and labor demands will so enhance British costs as to render shipping and shipbuilding profitable even in America. The *New York Annalist,* in summing up the possibilities a few months ago, declared that "it was probable that for many years to come the cost of labor and materials in the United Kingdom and Germany would be as high as in the United States, and that the start which American yards had obtained, thanks to the war, would enable them to compete successfully with foreign shipbuilders." But with our coal and iron supplies, our steel works and shipbuilding yards and ports, all practically side by side; with our peculiar skill and aptitude in shipbuilding and seafaring; with our huge imports of food and raw materials, and equally abnormal exports of manufactures; with vast colonies and great allies prepared to give us practical trading preferences and to boycott our erstwhile greatest rivals, the Germans, we only need active and hearty co-operation between labor and capital and the state to keep us ahead of all nations in shipping. But such co-operation we must have, or fail in the international race.—*Engineering,* 3/8.

AMERICA'S SHIPBUILDING PROBLEMS.—Many circumstances combine to keep prominently before us the vital importance of the shipping question. Though submarine piracy has utterly failed to justify itself as "the best and only means of a speedy victorious ending of the war," as the Germans last February claimed it to be, the Admiralty's weekly returns of shipping losses remind us that the menace to our lines of communication continues to be grave. The belief that some sovereign remedy for the submarine will be discovered is cherished only by people who are without knowledge of naval technique. The practical view is set forth in the message recently addressed by Admiral Jellicoe and Sir Edward Carson to the Iron and Steel Trades Confederation: "There are only two weapons that we can use, and both can only be forged in the shipyards of the country. One is the class of warship that enables the navy to hunt and destroy the enemy's submarines; the other is every new merchant ship that takes the place of a ship that has been sunk." In this country the output of both types is now very large, and everything possible is being done to expand it still further. The figures which Mr. Lloyd George gave in the House of Commons on August 16 were distinctly encouraging. If present anticipations are fulfilled, the total output of shipping in 1917 will reach nearly 2,000,000 tons, which is practically the average of a normal year. At the same time, said the Prime Minister, our naval construction will also be increased by several hundred thousand tons. France and Italy are engaged in similar work to the full extent of their shipbuilding capacity, though both countries are handicapped by shortage of labor and raw material. America is more favorably situated, and it is to her that the Allies look for the largest contribution in new tonnage. The essential facts of the shipping position were laid before President Wilson's Cabinet by the British mission which visited Washington a few months ago. Shortly afterwards a huge program of emergency construction was framed by the Shipping Board and authorized by the President, and it was expected that the vessels would be put in hand without delay. The plan was to build 1000 cargo vessels of moderate size and speed, the majority being of wood, and two standard designs were

prepared with a view to simplifying the construction. The form of hull adopted, with its virtual absence of curves, would have enabled most of the work to be done by ordinary carpenters. The projected vessels had no pretence to beauty, but their seaworthiness was attested by the approval of the underwriters and their designed speed of 10½ knots was considered adequate for the work they were intended to do. Meanwhile, the Emergency Fleet Corporation, a sub-department of the Shipping Board, had been collecting and tabulating a great mass of information relative to the building facilities available on both coasts, and the capacity of the engineering firms to manufacture the propelling machinery for the wooden ships. The result of this inquiry showed that no difficulty need be apprehended in building and equipping 1000 vessels in a very short space of time. Ten firms alone pledged themselves to supply 496 vessels of the standard design in 12 months, and 786 in 18 months, while the 75 smaller yards on the two coasts which specialized in wooden construction were capable of turning out several hundred more. At this juncture, however, doubts arose as to the expediency of building such large numbers of wooden vessels, and General Goethals, as head of the Emergency Fleet Corporation, gave it as his opinion that steel ought to be substituted for wood. The controversy which followed ended in General Goethals resigning his position. Apparently, a compromise has since been effected, for the latest advices indicate that the cargo fleet will comprise both wooden and steel ships, in addition to others built on the composite system. Moreover, steam machinery will be widely used in place of the internal combustion engines with which it was at first proposed to equip all the new vessels, and we understand also that the dimensions and speed will be substantially increased. Thus the ships to be built under the modified plan will be superior in many respects to those originally projected, though it is to be hoped that the change will not involve undue delay in the execution of the program.

Mr. John Birkinbine, a consulting engineer attached to the Department of the Interior, has published some instructive data concerning the task which this great scheme will impose upon American industry. He considers that if the United States, in addition to its normal yearly output of 1,500,000 tons of shipping can launch 3,000,000 deadweight carrying capacity, her contribution to the common fund of Allied tonnage will be ample. This total would require an approximate weight of 3,000,000 tons of steel for the hulls and machinery, including 500,000 tons of structural shapes, and 1,500,000 tons of ship plates. His estimate is based upon the assumption that the new vessels will differ radically from the conventional type of slow cargo steamer with a deadweight carrying capacity of 10,000 tons and mediocre speed. Speed is now recognized as an important element of protection against submarine attack, and expert opinion in America consequently favors a minimum speed of 15 knots for all vessels intended to traverse the danger zone. But every extra knot means a considerable increase in the weight and area occupied by the driving plant, with a corresponding reduction of cargo space. It is, we think, a debatable point whether the sacrifice of carrying capacity—which might be as high as 50 per cent—entailed by raising the speed from 10 to 15 knots is compensated by the supposed increase in the factor of safety. There is evidence that the sea speed of the later German submarines is much higher than that of the boats which operated earlier in the war, and it is open to doubt whether a 15-knot steamer is much more immune from attack under present conditions than a slower vessel would be. To build a vessel of 15 knots speed and 5000 tons deadweight capacity would require about 850 tons of structural steel and 1750 tons of plating, and as the American yards expect to launch 600 such vessels within a year, the steel industry will be called upon to provide 510,000 tons of frames and over 1,000,000 tons of plating. As the normal yearly output of frames is 3,000,000 tons, the extra 510,000 tons would represent an increase of 17 per cent, while to the normal yearly figure of 2,400,000 tons of plating must be added 1,050,000 tons, or an

increase of over 40 per cent. It is pointed out by Mr. Birkinbine that, in addition to the increased production of frames and plates on the one hand, and of engines and boilers on the other, account must be taken of the extra structural work in the building and extension of mills, furnaces, cranes, manufacturing shops, punching and shearing machines, together with the necessary additions to the plant of the various shipbuilding yards. Then, again, mining operations will have to be conducted on a far larger scale than hitherto in order to supply the requisite increment of ore, fuel, flux, and refractory materials, and this, in turn, will mean a great extension of the structural steel and machinery in use at the mines and quarries. Finally, the problem of transporting all these raw materials, half-finished and finished products from mine and quarry to foundry, from foundry to shop, and from shop to shipyard, will place a heavy burden on the railway system, and render necessary an increase in the supply of rails, bridges, rolling stock, etc. "All these supplementary needs," says Mr. Birkinbine, "predicate a greatly enlarged productive capacity for our steel plants. Our normal consumption of steel products cannot fail to increase, rather than diminish. We must supply our army and the armies of our Allies with equipment, munitions and material. And this immensely increased demand will fall not merely on our present industrial facilities, but on the various manufacturing organizations, and peculiarly on labor. Complete, effective performance of the varied and complicated task demands co-operation of the closest kind on the part of every factor in that essential triangle—government, labor and capital." In ordinary times about 5,400,000 tons of structural shapes and plates are produced every year in the United States. To build an additional 600 cargo vessels this total must be expanded by 1,500,000 tons—a net increase of nearly 30 per cent, to which must be added a further 20 per cent, represented by the supplementary needs of the mines, foundries, railways, etc., specified above. In all, therefore, the output of steel will have to be increased by some 50 per cent.

From the foregoing facts and figures we are able to form some idea of the magnitude of the task which now confronts American industry, more particularly that branch of it which is concerned with the production of steel. It offers a wonderful field for that organizing genius, and that readiness to cope with extraordinary demands on which the American captains of industry have always and justly prided themselves. In so far as shipbuilding is concerned, we are confident that our American Allies will prove equal to every demand made upon them. Already they realize that, in the phrase of Mr. Lloyd George, "ships, ships, and more ships" is the watchword of victory. A month or two of precious time may have been lost in discussing the respective merits of wood and steel, but now that a decision has been reached there is every sign of a determination to tackle the problem with true American energy. This month of August—or was it not July?—was, according to official German predictions last February, to witness the total collapse of the Allies through the severance of their maritime communications. What, on the contrary, is the position to-day? The arrivals and clearances of sea-going ships at our ports show no appreciable reduction. Foodstuffs, munitions, and raw materials continue to arrive, if not in unlimited quantities, at all events on an adequate scale. It is true that ships are being sunk week by week, but against this steady depletion of the tonnage originally at our disposal we can set the great activity that now prevails in the shipyards of the United Kingdom, France, Italy, and the United States, an activity which, a few months hence, will result in large additions to the cargo-carrying fleet of the Allies. We confess that, after reviewing all the facts of the shipping situation, we can find no grounds for pessimism, but rather many sound reasons for supreme confidence in the ability of the Allies to circumvent the most desperate efforts of the enemy. Submarine piracy was initiated by Germany with the dual object of inducing a speedy and favorable peace, and of eliminating future competitors in the struggle for maritime commercial supremacy, which she anticipates

will begin immediately after the cessation of hostilities. By the irony of fate its effects bid fair to be precisely the opposite of what were intended, for not only are the Allies more than ever resolved to prosecute the contest until Germany has made full restitution for all the crimes she has committed, but the wholesale destruction of tonnage has given an impulse to shipbuilding in the United States which is likely to survive the present crisis and to reestablish the American mercantile marine on a scale that will make it a most formidable rival to German shipping after the war.—*The Engineer*, 24/8.

SHIP PROGRAM CALLS FOR 7,968,000 TONS.—The government's shipbuilding program calls for a total of 1270 ships of 7,968,000 tons it was revealed August 24 in estimates sent by the Shipping Board to Secretary McAdoo as the basis for a request for a new billion-dollar appropriation.

This is in addition to nearly 2,000,000 tons of shipping now in course of construction in American yards, which has been commandeered by the Emergency Fleet Corporation. A large part of the government fleet and of the commandeered fleet will have been completed by the end of the fiscal year, June 30, 1918. Building, commandeering, and purchases of vessels will total about $2,000,000,000.

Estimates of the entire cost of construction are given as follows:

Contracts already let, 433 ships (1,919,200 tons), $285,000,000.

Contracts ready to let, 452 ships (2,968,000 tons), $455,500,000.

Under negotiations, 237 ships (1,281,000 tons), $194,000,000.

One hundred and fifty miscellaneous vessels (1,800,000 tons), $300,000,000.

Construction of government-owned fabricating yards, $35,000,000.

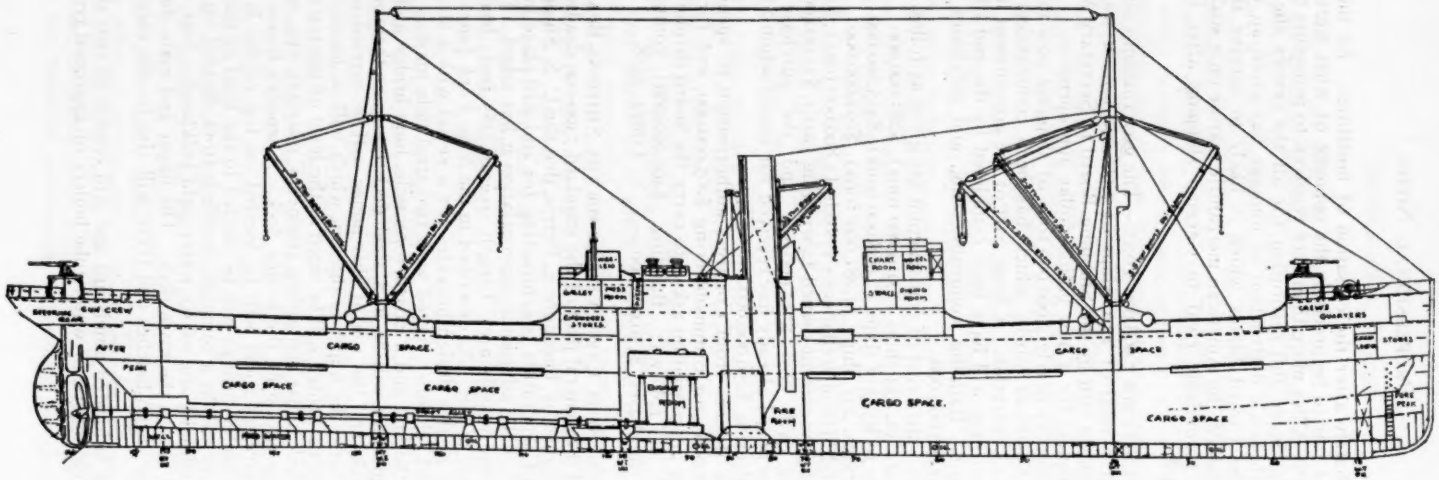
Commandeering will cost $515,000,000, and the purchase of ships $150,000,000. The board already has received for construction $550,000,000, and for commandeering $250,000,000.

The board now desires from Congress authorization to spend for construction $719,500,000; for commandeering $265,000,000, and for purchases $150,000,000. The appropriation asked to carry the board through the fiscal year is divided as follows: Building, $400,000,000; commandeering, $265,000,000, and purchases, $150,000,000.—*N. Y. Times*, 25/8.

DESIGN STANDARD STEEL CARGO VESSELS FOR THE SHIPPING BOARD.—Herewith is illustrated the general plan of the standard 7300-ton deadweight steel cargo vessels, designed by Theodore E. Ferris, that the U. S. Shipping Board Emergency Fleet Corporation is contracting for and will place more orders for when it receives the additional appropriation it has asked. The general dimensions of these vessels are: Length, overall, 385 feet; beam, 53 feet, and depth, molded, 30 feet. As described in the *New York Journal of Commerce* of August 23, this design provides for a vessel with a straight stem, elliptical stern and schooner rigged with two steel pole masts. There will be two decks to the hull and a raised forecastle, long bridge and full poop.

The officers' quarters will be in a steel deck house at the forward part of the bridge deck, and the top of this house will be carried to the sides of the vessel to form the upper bridge, on which will be located a wooden pilot house. A flying bridge will be fitted at the level of the top of the pilot house. A steel deck house containing engineers' quarters, etc., will be built abreast the engine casing on the bridge deck. A wooden house containing a hospital and wireless room will be located on top of the latter house. Steel engine and boiler casings will be carried to the level of the top of the deck house. There will be a complete double bottom, divided into five compartments longitudinally and of six water-tight bulkheads; four will extend to the upper and two to the main deck. The upper and main decks will be provided with five cargo hatches and there will also be one cargo hatch on the bridge deck.

The machinery is located amidships and will consist of two single-ended return-tube Scotch boilers, or water-tube boilers of approved type and size,



From New York Journal of Commerce

GENERAL DESIGN OF THE 7300-TON DEADWEIGHT CARGO SHIPS TO BE BUILT FOR THE UNITED STATES SHIPPING BOARD EMERGENCY FLEET CORPORATION

and one vertical inverted three-cylinder, triple-expansion engine, with cylinders 24½ by 41½ inches and 72 inches diameter by 48-inch stroke, or a geared turbine of equivalent power. The vessels of this design will be capable of an average sea speed of 11½ knots when fully loaded. The standardized steel ship is growing in importance under the present demand for tonnage and is believed by experts to be one of the solutions of the merchant marine problems of the present time. These vessels will be built under special survey of the American Bureau of Shipping to Class +A1 in the Record of American and Foreign Shipping, and their construction will also comply with all requirements of the general rules and regulations of the Steamboat Inspection Service.

The type of vessel here described is different from the fabricated steel ship which will be built in especially constructed shipyards, contracts for which have been pending for some time. While the Fleet Corporation has already adopted designs for the fabricated ships, it is not intended to make them public at the present time.—*The Marine Journal*, 1/9.

NEW CONSTRUCTION.—W. Averill Harriman, through the Merchant Shipbuilding Corporation, which he organized and controls, has just signed contracts with the Emergency Fleet Corporation for the construction of what is understood to be the largest amount of steel shipping tonnage so far ordered by the Emergency Fleet Corporation from any single concern. The Merchant Shipbuilding Corporation operates Mr. Harriman's new shipyard at Bristol, Pa., on the Delaware, and this yard is to construct for the government forty 9000-ton fabricated steel freight steamers.

Mr. Harriman controls two shipbuilding corporations. He took over the Chester Shipbuilding Company, which owns and operates a yard at Chester, Pa., as a going concern, some months ago, from C. I. M. Jack, a Philadelphia engineer, who is now consulting engineer for both the Harriman companies. This yard had six ways when Mr. Harriman acquired it; it now has 10, and further extensions and improvements in its facilities are rapidly going forward. The Chester company and plant is now at work on 28 individual contracts for fabricated steel freighters, originally entered into with private individuals and shipping companies, all of which, however, have now been taken over by the Emergency Fleet Corporation in the process of wholesale commandeering of shipping on the ways.

The Bristol yard, where the 40 new freighters just contracted for will be built, is an entirely new one, and, in fact, has not yet been completed. Mr. Harriman himself, having chosen the site after an inspection of a large number of other water-front properties along the Atlantic seaboard, designed and commenced the erection of the plant. The Bristol plant has 12 ways, and it is expected that the first keel will be laid there in about three months or less. Mr. Harriman intends to have the last of the 40 freighters in commission within 18 months or less.

The contract between the Merchant Shipbuilding Corporation and the Emergency Fleet Corporation was negotiated on a different basis from previous contracts for ships entered into by the government. The Emergency Fleet Corporation leases the Bristol yard, plant and facilities outright from the Merchant Shipbuilding Corporation, under its terms, and employs the latter simply as its operating agent to build the ships for a fixed fee per ship, the amount of which is not made public.

The vessels, however, although generally resembling the standard steel freighters designed by the Emergency Fleet Corporation, will be built to designs of the Merchant Shipbuilding Corporation. The President of the company (Mr. Harriman is chairman of the Board) is R. H. M. Robinson, one of the best known naval architects of the United States, who was formerly a naval constructor in the United States Navy. He is an intimate friend and associate of Rear Admiral Taylor, Chief of the Bureau of Construction, and himself has designed and built several battleships for the United States Navy. The designs for the Merchant Shipbuilding Corporation freighters were prepared under Mr. Robinson's personal supervision,

and include a number of special features not possessed by the standard types of the Emergency Fleet Corporation. They will be of 11 knots' speed.—*N. Y. Times*, 28/8.

Contracts for the construction of merchant ships to the value of $100,000,000 were signed by the U. S. Shipping Board on August 11, the tonnage represented being 775,000. The contracts provide for a considerable proportion of steel construction, although there are a large number of wooden hulls also provided for. In all there will be in the neighborhood of 150 ships constructed. The Emergency Fleet Corporation approved contracts on the same day for about 50 ships, steel and wood, with a total displacement of about 200,000 tons. The cost of the vessels will be $25,000,000. These contracts were passed by General Goethals, but never were signed. Builders of the vessels for which contracts were let announced on August 11 they would organize a national shipbuilding association, with offices in Washington, and would seek to enroll as members all builders of the country. B. W. Morris, of the Groton Iron Works, Connecticut, will be named president of the association. Seven cargo and passenger carrying vessels flying the American flag have been requisitioned by the board. These are the first to come under the general order of commandeer. They will be turned over to the War and Navy Departments as supply transports.—*Army and Navy Journal*, 18/8.

GOVERNMENT-OWNED SHIPYARDS.—Contracts for construction of three government-owned shipyards for building fabricated steel merchant vessels were awarded August 31 by the Emergency Fleet Corporation to the Submarine Boat Corporation for a plant at Newark, N. J., the American International Corporation for one at Hog Island, Pa., and the Merchants Shipbuilding Co., for one at Chester, Pa. The yards will cost $35,000,000, and the government is given an option to purchase the lands on which they are located. The builders of the yards are given contracts for building in them 200 ships. The prospects are that contracts for more vessels will be let when these are completed and more money is available. The Submarine Boat Corporation will lay ways for building 28 ships simultaneously, and will have facilities and equipment to turn out one 5000-ton ship every two days after the first vessel is completed, so the announcement runs.—*Shipping*, 8/9.

NAVAL OFFICERS AND EMERGENCY FLEET CORPORATION.—Rear Admiral F. T. Bowles, U. S. N., retired, and Naval Constructor Elliot Snow, U. S. N., have been appointed special assistants to Rear Admiral Capps, U. S. N., general manager of the United States Shipping Board Emergency Fleet Corporation.

Rear Admiral Bowles was Rear Admiral Capps' predecessor as chief constructor of the United States Navy, and after his retirement from the navy he was for several years president of the Fore River Shipbuilding Company. Naval Constructor Snow has been in charge of naval construction at the League Island Navy Yard, Philadelphia.—*International Marine Engineering*, September.

TONNAGE FROM GREAT LAKES.—Plans for taking a large amount of tonnage out of the Great Lakes for Atlantic service will be completed by the Shipping Board soon. It is estimated that between 200,000 and 400,000 tons can be removed before the winter season. Some of the vessels will have to be cut in two before they can be put through the Welland Canal locks. The intention is to replace this tonnage during the winter with ships now building in Lake ports.—*Shipping Illustrated*, 25/8.

SHIPPING BOARD PLANS TO OPERATE BARGES.—Operation of all North Atlantic tugs and barges under a central authority to bring about maximum

efficiency of service is proposed by the Shipping Board. Shipping men were asked to attend a conference at Boston, September 18, to work out a plan with a representative of the board.

By pooling the operation of tugs and barges, it is claimed, cargoes would be expedited and full loads could be carried at all times, unloading conditions would be supervised and tows would be kept away from congested ports. The Shipping Board hopes to announce a definite plan of control soon after the Boston conference.

The Shipping Board's plan probably will provide for a director to handle the entire subject. Branch offices will be established in New York, Boston, and Philadelphia, and representatives would be named at other leading ports.

The decision to work out a plan for more efficient operation of barges was prompted in large measure by the New England coal situation. New England coal is handled largely by barge from Hampton Roads, and army and navy requirements have drawn heavily on coastwise transportation facilities. At the very best, it is said, the New England states this winter will run short of fuel supplies, and every effort will be made to keep industries and homes from suffering actual privations.—*N. Y. Times*, 9/9.

WOOD SHIPYARDS NOT TO BE COMMANDEERED.—Advices by wood shipbuilders of Seattle announce that the Shipping Board has decided not to commandeer wood shipyards or wood auxiliary powered vessels, and that no new contracts for wood ships would be let for the present. It is understood that the work of the government contracts now out will be rushed as speedily as possible.—*Shipping Illustrated*, 1/9.

WOOD STEAMER PROGRAM ABANDONED.—The crazy wood steamer program has been definitely abandoned by the Shipping Board. No more will be ordered by the United States, but those already contracted for will be completed. By this action the reorganized Shipping Board has, in effect, sustained General Goethals, who, with former Chairman William Denman, was forced out of the Emergency Fleet Corporation, following a now historic controversy.—*Shipping*, 8/9.

BONUS FOR OWNERS AND MEN.—Officers and men remanning the German and Austrian ships taken over by the United States Government receive a 50 per cent war bonus. This bonus extends from the highest officer down to the deck boys. Captains receive $250 a month regularly and a bonus of $125, making their total compensation $375 per month; seamen $60 per month, plus a bonus of $30, and deck boys, the lowest paid of all, a total of $45 per month. Numerous students from the free government and marine engineering schools have been placed in good positions aboard these ships. There is still a heavy demand for deck officers and engineers in the coastwise and transatlantic service.—*Shipping Illustrated*, 1/9.

PANAMA CANAL TONNAGE.—The total number of ships making the transit of the Panama Canal during the fiscal year ending June 30, 1917, in seagoing traffic was 1876. In the fiscal year 1916 the total was 787; in 1915, it was 1088. The aggregate gross and net tonnages of the 1088. The the year 1917, according to the rules of measurement for the Panama Canal, were 8,530,121 and 6,009,358 tons, respectively. The cargo carried through the Canal amounted to 7,229,255 tons of 2240 pounds.—*Army and Navy Register*, 15/9.

PERSONNEL

TRAINING SCHOOLS.—A training school at Newport, R. I., to fit members of the naval reserve for commissions in the navy, will be opened by the Navy Department at the Cloyne schoolhouse. A course of four months will be given.

Through the Division of Naval Militia Affairs the Navy Department has approved of another federal training station for the naval militiamen to be located at Rochester, N. Y. This station occupies the armory of the Third Battalion, located on Lake Ontario.—*International Marine Engineering,* September.

NEW NAVAL WINTER CLOTHING.—Special provision has been made by the Navy Department for a new outfit of winter clothing intended for issue to members of the deck crews. The outer garment is a rubberized rainproof and wind-proof suit, the coat having a hood that fits over the head and closes tight at the neck. The sleeves also button tightly around the wrist to prevent any water coming through. The trousers button tight at the bottom. Under this is worn a heavy woolen blanket overshirt that comes almost to the knees. It also has a hood that comes over the head and fits tight around the throat. A heavy woolen jersey is also furnished. Two kinds of underwear will be supplied—one the usual winter weight, the other a very heavy garment of double thickness at the chest and over the back to give added protection. In addition to regular woolen socks, extra-heavy "woodsmen's socks" will be provided. Over his shoes the seaman will wear fleece-lined rubber arctics, 15 inches high, reaching to a point just below the knee. Heavy fleece-lined mittens will also be furnished, in addition to the regular woolen gloves. There is a warm watch cap that fits down snugly over the ears. Each man also will have his overcoat and other things that are included in the regulation outfit. Before they sailed last April the crews of the American destroyers now on service in the anti-submarine warfare in European waters were not only given full winter outfits, but were provided with one of the warmest garments, a fleece-lined rubberette coat, the lining being of heavy lamb's wool, the sleeves lined with corduroy velvet. They had regulation overcoats, a heavy oilskin suit, consisting of coat and trousers, thoroughly water-proof; woolen jerseys, woolen mitts and socks, woolen watch caps, heavy woolen underwear, and rubber boots, in addition to their regulation blue uniforms and full outfits of clothing.—*Army and Navy Register,* 25/8.

COAST AND GEODETIC SURVEY.—The Secretaries of War, of the Navy, and of Commerce have issued regulations covering the duties to be performed by the personnel and vessels of the coast and geodetic survey in accordance with the act of May 22, 1917. The President is to designate such vessels, equipment, stations and personnel as are to be transferred to the service and jurisdiction of the War Department or of the Navy Department. The date of such order will determine the responsibility of the War and Navy Departments over the personnel and ships transferred. All aliens, members of the crews of such vessels as are transferred, are to be discharged or ordered to other duty in the coast and geodetic survey prior to transfer. The personnel of the vessels transferred are to be enrolled in the naval reserve force; otherwise, they will not be transferred. When the commissioned officers are transferred their status will be that of staff officers, unless they are commissioned in the army reserve, or national army, or enrolled in the naval reserve force in such ranks not below their relative ranks at the time of transfer as they are qualified to fill. Officers other than commissioned officers will be given such commissions as they are qualified to fill, and their pay and allowances are not to be less than at the time of transfer. Provision is made for the return of vessels and equipment in as good condition as when transferred, the department having had use thereof to bear the expenses incident to making necessary repairs.—*Army and Navy Register,* 8/9.

LOYAL NAVY YARD MEN.—The disloyal attempt to delay war preparations through a shipbuilding strike has failed. The address of the men employed

in the League Island Navy Yard to the Secretary of the Navy is a manifesto of true patriotism:

"We desire by our example to stimulate all others to the fullest performance of their duty to the country at this time. We promise to stand by you shoulder to shoulder in carrying out measures for the development of our navy. . . . . We promise to notify our superiors of any indication of disloyalty on the part of any employé working for the government. . . . . With the fullest confidence that our country is in the right in this war, and relying on the wisdom of President Wilson, we earnestly pray for a speedy success for our cause and we pledge you by our work to do our full share toward the victory which will ultimately be ours."

So every honest citizen feels. The men in the navy yards are doing work of as great value to our cause as the soldiers can do. So are the men in all the shipyards. So is every mechanical worker whose services in his trade exempt him from the military draft. In the Brooklyn Navy Yard there is no indication of a strike. There may be shipyard strikes here and there, but it is not conceivable that any of the men employed by the government will stop their work. The man with a German name who advised the shipyard men to "pull the navy yard" will find that his influence is just what it ought to be. Wages for war work should be just. But in the nation's hour of peril the unions must be prepared to make concessions.—*N. Y. Times*, 24/8.

NAVAL RESERVE OFFICERS.—One hundred and seventy-four officers of the naval reserve completed their course at Annapolis, September 14. Additional officers of the reserve will be given instruction at the Naval Academy, according to the *Washington Post*, which says:

"Training of temporary ensigns of the naval reserve will be continued at Annapolis until a sufficient number to meet increased navy needs have been obtained. Mr. Daniels, Secretary of the Navy, said September 14 that a second class of 300 will open at once, and that this training will be continuous.

"Assignments to this training will be proportioned on the basis of the enlistments in each naval district."

SUBMARINES

THE SUBMARINE PROBLEM.—The stage at which the Naval Consulting Board has arrived in its grapple with the problem of the submarine is outlined in the first bulletin on "The Submarine and Kindred Problems," issued by the board. The pamphlet is primarily intended to serve as an aid and guide to citizens who are responding to the board's request for suggestions on how the U-boat menace may be met. Thousands of such suggestions, it is stated, have been received since the board made its appeal.

The latest type of submarine in use abroad, the pamphlet states, "has a surface speed of at least 17 knots an hour and a submerged speed of probably less than 10 knots. If running near the surface the periscope might be raised, a quick observation taken, and lowered again, within 30 seconds. If, however, the submarine is on the surface and hatches uncovered, from one to four minutes will be required to completely submerge, depending upon circumstances."

Four lines of investigation to combat this instrument of destruction have been followed by the Naval Consulting Board. They are:

1. Means of discovering the approach of a hostile submarine and locating it so as to permit of prompt action for combating its attack.
2. Protection of cargo carrying ships by nets, guards and screens.
3. Protection through decreasing the visibility of vessels.
4. Methods of destroying or blinding a hostile submarine.

Aeroplanes are one of the best means for detecting the under water boats, even when they are submerged to a great depth. The chief difficulty has been to make use of these aerial detectors far out at sea. The construction of "mother ships for carrying and launching aeroplanes" is a good way to meet the problem, but present conditions make such construction a slow process. Sound recording devices based on the principle that water is an excellent conductor of sound, are being carefully tested, and there is promise that investigations in this field may some day make it possible to locate surface vessels, submarines and even moving torpedoes.

Concerning the protection of cargo carrying vessels by nets, guards and screens, the board has received many proposals, but not one up to the present time has received the approval of the Navy Department or of the Merchant Marine. The principal objections to the suggested devices are their weight, cumbersomeness in heavy seas and interference with the maneuvering of a vessel.

"The undeniable evidence which has been accumulated during the last few months of submarine activity," the pamphlet states, "has demonstrated that the immunity of a vessel to submarine attack is dependent very largely on its speed and also its maneuvering ability."

To decrease the visibility of ships improved smokeless combustion combinations are being studied, the positions of vessels at a distance being determinable by submarines only by observing the smoke, which floats high in the air.

For the destruction of submarines the rapid fire gun is the best known weapon, but the board appears to place more faith in a method concerning which comparatively little has been heard. This consists of setting off a heavy charge of high explosive, well submerged, when the near presence of a U-boat is reported. An explosion under water has a powerful effect on all neighboring bodies and will usually suffice to destroy or cripple a U-boat.

To blind the submarine heavy black petroleum or other oil, which floats on the surface of the water, has been found valuable, as it clouds the optical glass at the exposed end of the periscope. Under favorable conditions the production of a heavy "smoke screen," formed by burning chemicals such as phosphorus and coal tar or else by the incomplete combustion of fuel oil, has been found to make possible frequently the escape of an attacked ship.

Electro-magnetic and electric devices to offset a U-boat attack sent to the board generally appear to be based on misconceptions of these natural forces.

One of the most interesting parts of the pamphlet deals with the problem of "bottling up" the submarines before they can get out to sea. It is as follows:

"The question as to why submarines are not destroyed before they reach the open sea is a most natural one, and the best answer which it is possible to give, according to the officers of our navy and those of the foreign commissions who have visited this country is as follows:

"The submarine bases are very strongly protected by land batteries, aeroplane observers, and large areas of thickly mined waters extending to such distances that the largest naval gun cannot get within range of the bases. In spite of these protections, there is now going on a continuous attempt on the part of the allied navies to entrap or otherwise defeat the submarines as they emerge from the protected areas. Nets are laid and as promptly removed by the enemy, whose trawlers are in turn attacked by our destroyers. The design of these nets and the detailed arrangement of their fastenings and attachments offer a broad field for invention, but it should be remembered that they must be capable of being used in waters in which there is a tidal current running from two to five miles an hour. Many suggestions for 'bottling up' these bases have been offered,

but as will be realized, it is not desirable to punish information which would indicate even in the smallest degree this country's plans."

The board still desires suggestions, which should be addressed to Thomas Robins, Secretary Naval Consulting Board, No. 13 Park Row, New York City.—*Army and Navy Register,* 25/8.

AIR-STARTING VALVES FOR DIESEL ENGINE.—For the last batch of submarines the U. S. Navy Department endeavored to dispense with the air-starting valves for the Diesel propelling engines, the main idea apparently not being to do away with the air compressors, but to simplify the cylinder-head construction, and reduce the number of orifices in the casting, thereby assisting to prevent the cracking of the heads, says *Motorship.—The Engineer,* 28/8.

LESSONS OF THE WAR

COMMANDEERING OF VESSELS.—Apparently unsystematic commandeering of vessels by the Navy and War Departments is causing great confusion in various industries. Recently three vessels carrying sulphur from Texas to North Atlantic Ports for use in munition industries have been commandeered by the War Department. Incidentally, seven oil tankers have been commandeered by the Navy Department. There is growing pressure for the establishment of some system of joint regulation which will recognize the need of all departments and all interests, co-ordinating the problem and simplifying it.—*Shipping Illustrated,* 25/8.

THE HEELS OF ACHILLES.—The following article by Walter Scott Meriwether, appeared in the *Scientific American,* September 1:

"It is a recognized principle of our military and naval strategists that no aggression of an enemy can be successful until he has destroyed our battleship force; also that we cannot prevent an enemy from landing unless we prevent him with our fleet. One reason is that shore fortifications can defend only their particular neighborhoods; another rests in the fact that this country has upward of 21,000 miles of seaboard and that there is not enough money in the world to fortify the entire stretch.

"Every undefended section would be a heel of Achilles, as it would leave the nation vulnerable at that point. A board that had been delegated to inquire into this subject reported a year or so ago that there were 116 places where it was perfectly practicable for an enemy to land an invading force without hindrance from fortifications. Therefore, any estimate of the amount of money that would be required to make our entire seacoast invulnerable to attack runs past the counting of man. It was not coast defence fortifications that kept the German heel from British soil. Nor can fortifications avail to fend invaders from our shores.

"Yet in the estimated budget for war expenditure the largest single item of the enormous total was $2,468,613,000 for fortifications and seacoast guns. Although we are not told that this is largelv for field artillery, let us consider a moment what that sum could supply if diverted to other defensive uses. For example, it would be sufficient to construct 150 dreadnoughts and leave a balance big enough to maintain them for a longer period than the present war is likely to last. While there has been a rapid upbuilding of navies since the war began, yet it is doubtful if all the dreadnoughts in the world now total 150. Of this total the United States has 14 in commission and five nearly completion. If to this 19 were added 131 more, could any one conceive of any power or any group of powers, even though that group comprised every nation on earth, making an attack upon a nation defended by 150 dreadnoughts.

"This is no effort to prove that we need 150 dreadnoughts. The contention is that if we are to expend an enormous amount of money for defence it would be wiser to employ that money in building dreadnoughts

instead of putting it into forts. For a dreadnought is more powerful than any fort. It is a more efficient defensive weapon for the reason that while a fort is immobilized and can defend only the area within the range of its guns, a dreadnought can carry its more powerful battery to any threatened point and move to it with celerity. Expend $16,000,000 on an immobile fort and you have a fortification that may be able to fend off attack from its immediate neighborhood. Employ $16,000,000 in dreadnought construction and you have a steel mobile fortress which can rapidly move its tremendous power of offence and defence to any section of the coast, or move seaward to strike the foe before he can threaten the coast. Put another way, which is the wiser plan, guardian bull dogs that are chained to certain spots or guardian bull dogs that can rove singly or in packs?

"With a preponderance of dreadnought strength, no enemy will ever start from the other side to dispute that supremacy. His transports will remain at home for if he should undertake the extremely hazardous experiment of landing an army in the face of a preponderant naval force, every condition would favor a great tragedy for the assailants. Doubtless an energetic foe would be willing to take any reasonable chance and pay any price for military success. But here the chances would be as nothing and the price would be stupendous.

"There are many who have a notion that submarines when operating under the protection of shore fortifications are sufficient for all purposes of defence. So far as fortifications go, New York is the best defended of all our seaports. Yet it has been proven by the war games of the War College, that 100 submarines, if unsupported by battleships, could not prevent an enemy's fleet from most disastrously shelling New York City.

"The reason for this is that a fleet coming to attack New York would necessarily be superior to any defending force and would keep several hundred miles back of its scouting line. It must also be assumed that the scouting line could overwhelm anything we could send against it. Such a screen would sweep everything before it, and chase away or destroy all submarines before the fleet would approach the coast, and even then it would not come in without being surrounded with its screens.

"There are still some others who pin their faith to mines and believe that these when protected by shore fortifications and operated in conjunction with submarines are sufficient for seacoast defence.

"It is pertinent to quote testimony from Vice Admiral Sims who, before he was detailed to command the destroyers now operating with our Allies, was President of the Naval War College, and prior to that was commander of the submarine and destroyer divisions. He has gone on record as saying in reply to this contention, that:

"'Unless you can support mines and submarines with a superiority of surface craft, there is no difficulty in an enemy's getting either out of the way. Any expedition that comes over would have two or three screens in front of the main body. These screens would be about 10 miles apart, and any submarine attempting to get underneath these screens must come up before reaching the main body, and when he does he must stay on the surface as by then he would have finished his submerged run. As for mines, we have no difficulty in sweeping them out of channels.'

"So at last it all comes back to the dreadnought, the backbone of the navy, the ultimate force with which to meet aggression. The question is frequently asked, 'if a 400-ton submarine can sink a 40,000 ton dreadnought, what is the use of building more dreadnoughts?' But the submarine cannot do it, at least they have not done it during the three years of the present war. The only dreadnought which has succumbed to an underwater blow is the British *Audacious*, and it is not generally known whether it was a mine or a torpedo that sent her to the beach with one or more compartments flooded.

"That our own later types of dreadnoughts have been made impervious to torpedo attack was indicated by the testimony of Rear Admiral Taylor,

the chief constructor of the navy, before the House Naval Committee. He did not give details as these are confidential. But it is well known that prior to the building of the *Pennsylvania* type of dreadnought, there had been extensive experiments with caissons built to represent sections of hull and that one after another the caissons were blown in by torpedoes until one was at last designed that could withstand the shock. Thus the name of this super-type of battleship, the majestic dreadnought, becomes even more luminous.

"Possessed of a sufficient number of these, with battle-cruisers, destroyers, submarines and auxiliaries so proportioned as to make up a well-balanced fleet, and this country could easily forego any further appropriation for coast defences except for the maintenance of those already constructed."—*Scientific American*, 1/9.

SAFETY FIRST AT SEA.—It is with a painful shock that we find confronting us, at this late date in the campaign of submarine warfare, the necessity of urging shipowners to safeguard their vessels against U-boat attack. We had supposed that these men would be using every precaution available to protect their vessels, their cargoes and above all, the lives of the crews.

The whole world, except Germany and her allies, has been trying to devise some means of combating the submarine. Countless suggestions appear in the editor's mail every week from all corners of the earth. Every one is trying to save the merchant marine from the frightfulness of the U-boat; and yet we find that the owners of these vessels—not all of them we are thankful to say, but a shamefully large proportion of them—seem to care very little what becomes of their boats. At least, they are unwilling to go to any material expense for safety precautions.

Sixty years ago a non-sinkable vessel was built. We believe this vessel could sail across the Atlantic to-day and defy the attacking submarines. The vessel was described in our issue of August 18—the "Great Eastern," whose hull was fitted with 15 transverse bulkheads carried up 30 feet above the water-line. But on the grounds of economy, the construction of this vessel was not copied by other vessels. It was held up as an example of ultra-precaution. Maybe it was, for peace times, but we are at war now, when questions of economy should receive secondary consideration and the safety of a vessel should stand pre-eminent. Yet our emergency fleet is being built along the old lines with few bulkheads that barely run up to the water-line.

A prominent shipowner recently made the statement that it is more profitable to lose one vessel out of every 12 than to give up 25 per cent of the cargo space in a ship. The loss is covered by insurance and represents no loss to the owner. Restriction of cargo space represents a permanent, an unrecoverable loss to the owner. It is a national characteristic to take a chance, particularly where the returns are likely to be large. Even ship captains themselves often prefer to run a risk rather than to take the simplest precautions.

In a recent issue we told of the zig-zagging course pursued by ships when in the infested areas; and described a simple apparatus which would enable the captain of a vessel to keep the boat on its course. Despite the known efficacy of such dodging many captains fail to depart from the normal straight course, merely because of the bother of keeping track of their whereabouts.

Strong government action is needed to compel ship captains, and above all, to compel shipowners to use the simple and practical precautions that have been worked out. A mild effort in this direction is now being made by the Treasury Department, which has issued a set of requirements for all vessels sailing through the infested areas. If these requirements are not complied with, the bureau will increase the insurance premium by ½ to 1 per cent for each voyage, reserving the right to decline to insure those vessels whose owners have not, in the opinion of the bureau, made a

satisfactory effort to carry out the regulations. The vessels are required to be armed in accordance with the recommendations of the Navy Department. They must be painted in such a manner as to reduce their visability at sea. They must carry enough smokeless fuel for use during the daylight runs while within the submarine zone. They must be provided with smoke boxes which will produce a screen of smoke when thrown overboard.

The threat to increase the rate of insurance may have some small effect, but it will not necessarily compel compliance because few of the vessels are American, and many, even of the American vessels, carry British insurance or are insured by private companies Not until the government takes hold of the situation and enforces compliance with its requirements can we hope for any very material abatement of submarine warfare. This is a matter in which the whole country is vitally interested. The submarine is affecting America more than any other feature of the war. We are even curtailing our food supplies in order to offset the work of the submarine. Shipowners must give evidence of real co-operation or the public will call them to a serious accounting.—*Scientific American*, 1/9.

MISCELLANEOUS NOTES

THE U-BOAT AND THE DREADNOUGHT.*—It is difficult, if not impossible, for us who are living in this great historical period of the war, to always maintain a true objectivity of decision in discussing military affairs. We are standing in the midst of a whirlpool of events. What holds true to-day is obsolete to-morrow, and no one can foresee what will happen next. This situation accustoms us to regard the facts of to-day as blank coins, the future value of which is still to be stamped upon them.

In this class belongs the question now occupying many minds, at least tacitly, of whether on account of the appearance of the submarine the days of the dreadnought are numbered; or whether it still possesses the right to a continued existence which is purchased at the sacrifice of huge sums of money.

Whoever tackles this subject with the mass of facts furnished by the war, at least when it is a question of an unprofessional opinion, will at once come to the conclusion that the U-boat has triumphed; that David has driven Goliath from the field. Then what rules the sea? The U-boat! Fearing the clutch of their tentacles, which draw everything to the bottom of the sea, the steel-protected squadrons of the British Navy, numbering many hundreds of thousands of tons of armored ships, dare not venture out of their harbors; and the merchant vessel must protect itself—a situation never before heard of in the whole history of the British Empire. That this is the situation at sea is an indisputable fact. The question simply is: What does it prove? Will the same thing happen again in future wars? What lessons will be drawn from the present war by the different navies?

If it was already a difficult matter before the war to play the prophet in military matters, it will be a still more thankless task after the war; for this gigantic struggle of nations has by its outbreak more or less shattered all existing things and in many respects forced the course of human development into new paths. Nevertheless, many lessons may be drawn from the events of the war, and their significance to the future may even now be regarded as practically established. Let us consider first of all the dreadnought and the justification of its class.

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* This translation of an article by Fregattenkapitän v. Waldeyer-Hartz, which appeared in *Die Illustrierte Zeitung* (Leipzig), July 12, 1917, is published on account of the interesting views expressed by the writer, a German naval officer, regarding the relative value of dreadnoughts and submarines, but the editor of the PROCEEDINGS of the United States Naval Institute does not share some of his opinions regarding the British fleet.

The dreadnought as a military-technical weapon has in all respects fulfilled the expectations. Tactically it has stood the test brilliantly, and it is only because of the form that the conduct of war has taken that it has been thrust into the background. This touches the very heart of the subject which we are about to discuss. In the strategical character of the present war is to be found the reason why the dreadnought fleets have not, outwardly at least, played the important part in the struggle which their great value as a means of warfare would warrant.

England, who in the years before the war had bragged by word and pen that Germany some morning would wake up and find herself without a ship, has never dared to make good this pre-war threat against the peace. The greatest of the world's sea powers has been held in check by a wholesome fear of the danger embodied in a German fleet whose numbers and fighting power command respect. The dreadnought would otherwise have played its important rôle at the very beginning of the war, for England most certainly would not have been so mindful of her squadrons if the German fleet had been less able to offer resistance. She is still, as always, taking good care not to lose any of her prestige at sea, in order that, when it comes to the arrangement of peace terms, she may throw the whole weight of her powerful navy into the balance of nations. Were it not for the realization of her own danger, which, converted into a reality, runs like a red thread through the German fleet law, it is certain that our German coasts with all their ports and industries would have fallen to the enemy at the very beginning of the war. If this had happened, submarine warfare would never have been practicable, because the possibility of carrying it on presupposes the co-operation of powerful technical bases. The professional press of England therefore has not refrained from representing the sparing of the grand fleet at the outbreak of the war as a grave error. They have even gone so far as to attribute it to the lack of initiative on the part of the British naval authorities. Whether or not this imputation is justified will not be discussed here. In any case the dilatory behavior of the British fleet is due to the significance which attaches to the German dreadnoughts. Our high sea fleet has more than once sought battle with the enemy.

Owing to the fact that England shrinks from a contest between battle fleets near the German coasts, a kind of stationary warfare has come into being on the seas, whose purpose is to rob the enemy of his freedom of commerce and thus prevent him from using his decisive element of power—his dreadnoughts—or at least only under conditions involving great risks. The mine in this connection has proved to be an even greater enemy to the battleship than the submarine. It encroaches upon the routes leading in and out of harbors until they become impassable to large ships. These, however, are conditions that will not obtain in future wars from the start. They are a result of the duration of the war and the dilatory methods adopted by the English. It would be a great mistake to draw from this strategical situation hard and fast conclusions as to what will happen in future naval wars and to base upon them the preparations carried out in time of peace in the way of material and naval construction. Most probably the present unusual situation will never occur again for the simple reason that it prolongs the war and thus increases the costs without bringing any decision.

It would be equally wrong to conclude that, because there have been only two important sea fights in home waters in this war, the dreadnought has no significance, and to regard such battles as a sort of medieval tournament without real value in war. If only one of the parties at war possesses a fleet of line-of-battle ships, there can, of course, be no engagement at sea. However, this would only prove that the "fleetless" party renounced all claim to the command of the seas from the very beginning. Let us also beware of making close comparisons with warfare on land, because there are many and marked differences between warfare on land and warfare at sea. On land the troops keep constantly in touch with each

other. This results in frequent and sudden battles. Naval warfare, on the contrary, produces only rare, but then important and decisive, battles. That is its peculiarity, and its aim is to bring into play all its forces at a single point and simultaneously. The fact that the weapons of the navy are inactive for rather long periods at times does not by any means justify the conclusion that they can be dispensed with.

As already pointed out above, submarine warfare is practicable only when its bases are safeguarded from the enemy. Obviously, the protection of the bases can be effected by coast defences in combination with mine obstructions. But we must not overlook the fact that a protection of this nature is always limited to a certain locality. It does not reach beyond the range of the guns. If it is to include a wide extent of coasts, the number of the personnel and the means required become considerable, and even then the protection afforded is but rigid and incomplete. The coast defences which we have established in Flanders have their full significance as defensive walls for our U-boat bases only in combination with the German high sea fleet, which, as an ever-menacing sword, stands ready to strike its blow on all sides. Yet, the significance of our high sea fleet makes itself felt in the remotest theaters of the war. It chains England's warships in their home ports and prevents their free employment. If it had not been for our dreadnoughts the war would most probably have taken a different course. That the Dardanelles remained in our possession is due, aside from their valiant defence, which is above all praise, primarily to the existence of our high sea fleet. Without its silently operating might, England would have been free from the start to bring quite other means into play. What the fall of Constantinople or the landing of strong forces in Jutland would have meant needs only to be hinted at.

And now to the U-boat. Its excellent qualities and wonderful progress are by no means to be underrated. Nevertheless, we must not fail to realize that the usefulness of the U-boat has its limits. In the first place it needs considerable depth of water, because it is as good as defenceless if it cannot utilize its power of submerging. The increase in the displacement of the U-boat, therefore, very soon reached its limit, which had the effect of limiting its military efficiency also. We must not on the whole overestimate the abilities of the U-boat. It can hardly be doubted that some practical means of fighting it will be found. Moreover, the safety of large ships against the danger of sinking is being increased in no small degree. The U-boat cannot be used in a general engagement either by day or night. It has no place in the battle tactics of an engagement between squadrons. It lacks absolutely the necessary speed, maneuvering ability and handiness. Its radius of action is and must remain limited. Its special value consists in the surprise attack. When exposed its value diminishes, sometimes even to insignificance.

It is true that our dreadnought fleet is not strong enough in numbers to break up the English blockade which has thoroughly sealed up the entire North Sea—but neither can the U-boats accomplish this. They cannot assure free sea routes to our commerce. Only a fleet which could drive the English from the field can accomplish this; and besides, what means will be employed in a future war to destroy the U-boat nests which, like ours, are protected by coast artillery and mines? That also can be accomplished only by a mobile battle fleet. Our enemies therefore will most certainly not fail to provide themselves with one. The shipbuilding policies of England and America and the professional press in both countries furnish decisive proof of this. Therefore, so long as it is the purpose of Great Britain and America to insure a freedom of the seas according to their own recipe, by means of battleships, a strong Germany, whose voice will still count for something on and beyond the seas, cannot depend alone upon U-boats, mines and coast defences as a means for safeguarding her interests at sea. Those who cherish any other hope, perhaps in the interests of the national purse, are, according to all appearances, committing

a fatal error. They confound the demand of the hour with future requirements, and are as wrong in their judgment as those who, basing their opinions on newspaper war experiences, would, for example, like to give the entire cavalry its walking papers.

Trench fighting has become possible on land only because the battle lines came to a standstill at the sea and at the boundaries of neutral countries. In this also it is very certain that in future wars both sides will make every possible endeavor to avoid the disadvantages resulting from trench warfare.

The freedom of the seas! An expression often used but for the most part with little thought. In the last analysis it can only mean that the milder laws of land warfare should also be made to apply to commerce at sea. If this be the final solution, then the U-boat will lose much of its value, for it is precisely in the war on commerce that it makes itself felt, and this would be abolished. In that event the decision at sea also would have to be fought out in actual battle—fleet against fleet!

Dreadnought and U-boat—they are not antagonists, but each the complement of the other as a means of naval warfare. The flying arm is as likely to drive the infantry from the field as the U-boat is to replace the dreadnought. Germany must take as her criterion the shipbuilding in other countries. Any deviation from paths generally accepted as correct leads to retrogression. The bitter lessons learned by France at the time of the so-called "Jeune Écôle" under Admiral Aube and Minister Pelletan, should also be a warning to us.

Si vis pacem, para bellum!

SALVAGING THE SUBMARINE "H-3."—During a heavy fog on December 14, 1916, the United States submarine *H-3* went ashore on Samoa beach, near Eureka, in Humboldt County, California. On December 28 bids were opened by the United States Government for salvaging the vessel either by putting her afloat in the ocean or hauling her from her position on the beach across the sand pits separating the vessel from Humboldt Bay, a distance of about one mile, and launching her in Humboldt Bay.

Six bids, ranging from $18,000 (£3700) to $72,000 (£14,800), were submitted for the latter operation. The lowest bid, however, which was submitted by the Mercer-Fraser Company, of Eureka, Cal., was so much lower than the others that the government was skeptical about the contractors' ability to carry out this work, and therefore decided to attempt to salvage the vessel themselves by towing her to sea.

For this purpose, the United States cruiser *Milwaukee,* the monitor *Cheyenne* and the naval tug *Iroquois* were sent to Eureka. Two steel cables 2 inches in diameter and 4000 feet long were attached to the submarine and to the stern of the *Milwaukee.* During a heavy fog on the night of January 13, after the *Milwaukee* had been pulling on the lines for about two days, the *Milwaukee* drifted into the breakers, due to the weight of the cables and the strong current. At the time of this mishap the tug *Iroquois* was connected to the bow of the *Milwaukee* with a long towline, which parted, and before another line could be attached the *Milwaukee* hit the bottom and within a few hours she was well into the breakers, finally becoming a total wreck.

On January 23 the government again opened negotiations with the Mercer-Fraser Company, and on January 26 signed a contract with this company for salvaging the submarine at their original bid. Between the time that bids were originally opened and the signing of the contract the submarine had shifted north on the beach about 300 feet, and had settled into the sand about 6 feet deeper, which made the salvaging work much more difficult. At low tide the water rested for a distance of about 75 feet outside of the boat, and at high tide it came up on the beach about 250 feet

inside the boat. Fig. 1 and the frontispiece show how deeply the submarine had settled in the sand.

The first operation carried out by the contractors was to place seven steel cables, each 2 inches in diameter, around the submarine, for the purpose of lifting her out of the sand. Placing these cables under the vessel was not only the most difficult part of the work, but it was the feature which made the task seem to others almost impossible. Owing to the fact that the beach was of quicksand formation, it was impossible

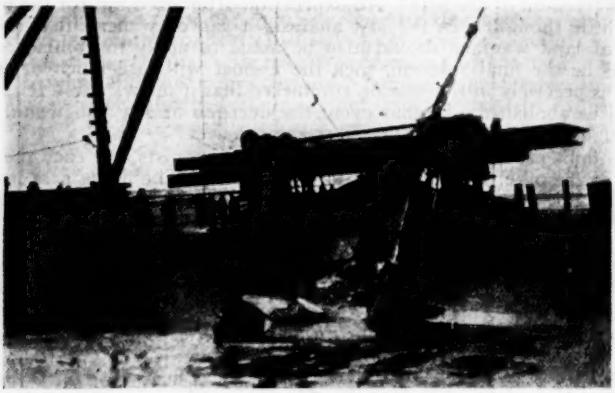

FIG. 1.—Timber Crib Work over Submarine

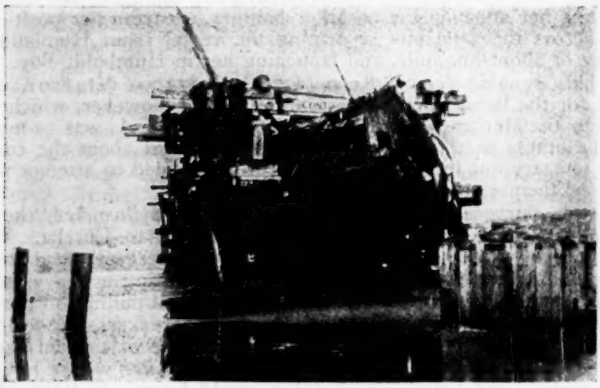

FIG. 2.—Submarine Lifted from Quicksand

to excavate around or under the boat, or to pump the water out of such excavation, because this would only tend to cause the submarine to sink deeper into the sand.

The manner in which this difficulty was overcome shows the resourcefulness and ingenuity of the contractors. A force pump was set up on the beach and two lines of 2-inch hose attached to it. To the end of this hose two long joints of pipe were attached, and on the end of the pipe a small cable was attached. The pipe was placed in position where it was desired to place the cable, and at such an angle that when the pump was

started and water turned into the pipe, the pipe would work down into the sand so that the end of the pipe with the cable attached to it would come just under the keel. Water was then run slowly through this and a pipe was jetted down from the opposite side of the submarine at such an angle that the end of it would intersect with the end of the other pipe to which the cable was attached. This made a hole in the sand large enough to admit a ¾-inch rod hooked at the end. By fishing with this the end of the small cable was hooked and pulled through under the submarine. It

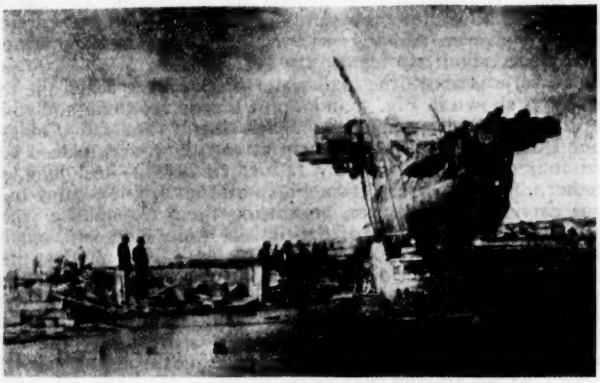

FIG. 3.—Vessel Moved on Rollers 150 Feet up the Beach

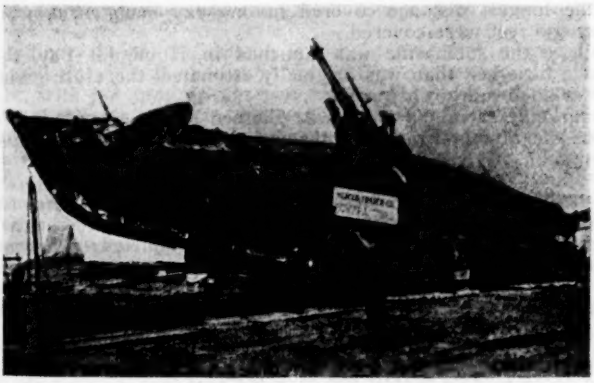

FIG. 4.—Arrangement for Transporting Submarine to Humboldt Bay

then became a simple matter to pull the 2-inch lifting cables around the submarine in the desired positions.

After the cables were in place a timber crib work was built, as shown in Fig. 1, to provide a means for lifting the submarine with screw jacks. The cross timbers were built up in units of four. Each timber was 12 inches by 12 inches in section and was of sufficient length to extend over the full width of the boat. Fourteen Norton ratchet screw jacks, with a capacity of 50 tons each, were used, and as the boat was estimated to weigh over 400 tons a good margin of safety was provided in the necessary lifting power and also in the strength of the lifting cables, as each of the seven cables had a breaking strength of 140 tons. Fig. 2 shows the arrangement

of the cribbing, etc., when the submarine was raised from the sand and ready to be hauled up on to the beach. The foundations for the jacks were placed on piling driven on each side of the ship.

Critical Point of the Salvage Work.—The critical point of the salvaging operations occurred at the time when the submarine was lowered on to rollers for hauling her up sideways on to the beach. While this operation was being carried out, the submarine was exposed to the tide, and, as the tide remained down only two and a half hours, any delay in the operations would have made it impossible to protect the submarine and she would have again settled down into the sand. This operation was carried out without a hitch, however, and Fig. 3 shows a view of the submarine after she had been moved about 150 feet up the beach.

After the vessel was above the high water mark on the beach the timbers were removed, as shown in Fig. 5, and a pine log, 80 feet long and 40 inches diameter at the small end, was placed on each side of the boat. Cables were placed around these logs and under them at each end were placed bobbers made up of four pieces of 14-inch by 14-inch timbers 20 feet long, solidly bolted together. As can be seen from Fig. 4 all the weight coming on these bobbers was carried at the center, permitting them to equalize when the grade was changed. The bottom of the timbers were shod with maple.

The Mile Journey Overland to Humboldt Bay.—For moving the submarine across the sand pits a distance of a little over a mile to Humboldt Bay, a track consisting of three pieces of 6-inch by 16-inch pine was laid and the submarine was moved on rollers, each 4 feet long and 8 inches diameter, of California laurel, spaced 4 inches apart under the bobbers. Power was furnished by a hoisting engine operating through a pair of five-sheave blocks. As no attempt was made to grade the sand hills down to a perfect level, the vessel was moved with this tackle over grades as high as 4 per cent. The submarine moved on an average of about 550 feet per day, the longest distance covered in one day being 1060, while on another day 930 feet were covered.

On April 20 the submarine was launched in Humboldt Bay, the job having cost a little less than was originally estimated, therefore giving the contractors a good margin of profit.

This remarkable salvaging work was planned by Mr. James D. Fraser, president of the Mercer-Fraser Company, and carried out under his personal supervision.—*International Marine Engineering,* September.

ITALY BUILDING STANDARD SHIPS.—The Italian dockyards are constructing steamships of a uniform type of about 8000 tons deadweight carrying capacity, the first of which has recently been completed.—*International Marine Engineering,* September.

DOCKING THE "KAISER WILHELM II."—Mr. H. C. Hardy wrote the following article which appeared in the *Scientific American,* September 8.

"Problem: *Given one ship 693 feet long over all, and one dry dock, designed to accommodate vessels not over 691 feet long, to dock the ocean liner in question successfully and without injury to dock or hull.*

"If this problem were part of a civil service examination for engineers, a commission on the sanity of the examiners would seem next in order. Yet exactly that problem was put up to the government engineers when it became necessary to put the *Kaiser Wilhelm II* of the North German Lloyd line in dock for cleaning and inspection and any repairs which docking might reveal as necessary.

"The dock is a part of a United States Government establishment 'somewhere on the North Atlantic coast,' maintained by the Bureau of Yards and Docks, Navy Department. It has a 10-foot margin allowed for clearance, so the problem, stated in exact terms, resolved itself into the apparently impossible one of putting 693 feet of ship into the 691 feet of space between the head of the dock and the caisson closing it.

"This seemingly impossible problem was nevertheless solved. The authorities modestly confess that a certain element of luck aided the ingenuity and care used in the operation, but the successful termination of this operation, which might truly be regarded as an engineering adventure rather than as an experiment, shows that engineering skill of a high order rather than chance was the deciding factor.

"To those who are uninitiated in the ways of ships and docks it must be explained that the process of docking a large vessel, while simple in essentials, requires a high degree of skill properly to accomplish. The ship to be docked is warped into the dock, towed very slowly into position by the use of power winches, and moored in such a position, that when the water is taken from the dock it will rest on an even keel in the proper position. As the water is pumped out, struts and braces are applied from the steps of the sides of the dock so that when the dock is finally dry, the ship is well supported at all points.

"Had there been plans available of the *Kaiser Wilhelm II* the problem might have seemed less difficult. Unfortunately, her German owners had not been thoughtful enough to leave a set on shipboard and there seemed insuperable difficulties in getting them from Berlin. So the services of a diver were employed, the ship lying at a berth in the yard in question, and he made as accurate measurements of the hull as it was possible to do under water. It was from these measurements that the engineers in charge came to the conclusion that the much-in-the-way extra 2 feet of ship could still be accommodated in the 691-foot space.

"When the *Kaiser Wilhelm* was in position, her stern nosed the head wall of the dock with a clearance of 0.1 of a foot. The caisson then had to be put in place, and here was where the calculations, measurements and skill came into play. A dock caisson is, to the layman, a ship in itself. That is, it is a structure designed to resist great lateral pressure, it has flotation, and can be raised and lowered by pumping water into and out of it. Its purpose is to act as the gate in a canal lock acts—to hold water back.

"In ordinary cases, the caisson is simply floated into position so that its foot will sink into the recess in the bottom of the dock provided for it. But here, with not only an absence of clearance but with 2 feet of ship for which there was no space, this could not be done.

"Yet the caisson ***had*** to be in position before the water could be pumped out, and while the measurements had shown that, once in position, the overhanging stern would barely clear the caisson shelf by fitting in between the braces, the problem was to get the caisson under the overhang.

"But the job was done. By towing the caisson into position (the ship's rudder had been turned to a 60-degree angle to get it out of the way) and partially submerging it, and then *tilting* it, it was edged in under the stern and fitted into its grooves. That the overhang actually *touched* the caisson shelf at this stage of the operation proves the narrowness of the margin which made the job possible.

"The non-technical reader should understand that in dealing with a 20,000-ton ship forces are brought into play which require the most delicate handling. A single slip at any stage of the game may cause not only damage to the structure but a possible loss of life, both on the part of those doing the work and those who will afterwards depend on the seaworthy qualities of the ship for safety. A ship is a structure designed to be supported everywhere—the water which upholds her provides a foundation for her stability. Remove this, and she becomes helpless as far as remaining an entity is concerned—improperly supported she would break in two. Consequently, the measurements taken and the work done in faith that they were rightly made were of the utmost importance. Had the water been pumped out of the dock, leaving the ship supported, like a bridge, by her bow end and the overhang of the stern resting on the caisson shelf, nothing could have prevented the most serious damage to the hull.

"But the engineers had discovered that the draft of the *Kaiser Wilhelm* forward was 4 feet less than her draft aft. As a consequence, as the water was pumped from the dock, the bow settled more than the stern, and when she came to rest on the bottom of the dock on an even keel the overhanging stem had lifted from the caisson by 3 inches, making a most workmanlike finish to the whole undertaking.

"The *Kaiser Wilhelm*, 693 feet long, was docked in a 691-foot dock with clear daylight all around, although measurable by the span of a finger and too little, at the bow, to thrust a hand between concrete wall and stem of ship.

"In view of the engineering difficulties surmounted with such nicety, and without any damage to the ship or dock, it is not difficult to find something less than forgivable enthusiasm in the very laconic footnote appended to the official report to the Bureau of Yards and Docks.

"'The manager considers that the construction officer and his assistants in charge of this docking operation are deserving of praise for the skill shown in placing in the dock a ship which would ordinarily be considered at least 3 feet too long to enter.'"

THE REVIVAL OF THE MONITOR.—Not the least remarkable feature of the great war is the reappearance of many weapons which had long been discarded as obsolete. To find a parallel to the methods of fighting which are now general along the continental battle-fronts we must go back to ancient history. Asphyxiating gas takes us back to the Chinese stink-pot, the "Flammenwerfer" to Greek fire, the trench dagger to the still remoter periods when man first discovered the lethal potentialities of cold iron, while certain forms of the trench mortar, which has become so indispensable in this war, are simply an adaptation of the ancient catapult. The list, which could be extended almost indefinitely, includes many weapons used in the naval campaign. A few years ago the monitor was regarded as a thoroughly obsolete type of ship, the construction of which had altogether ceased. Yet to-day we find vessels of the monitor class taking an active part in naval operations in almost every part of the globe. It may therefore be of interest to trace the development of this type from its advent down to the monitors of the present day, though for obvious reasons little can be said about the most modern examples.

Ericsson's *Monitor*,* built in 1861, was not a hasty project conceived under stress of a grave emergency. About eight years previously the inventor had submitted to the Emperor Napoleon a design which embodied all the characteristic features of the ship that subsequently proved a match for the *Merrimac*. He described the plans as those of "an invulnerable ship which could destroy with ease and impunity to itself the largest ironclad frigates now afloat." The French Emperor, however, was not sufficiently impressed to take any steps in the matter, and it was not until October, 1861, that the keel of the first monitor was laid at New York. She was launched three months later and delivered, ready for sea, on February 15, 1862, only 118 days from her commencement. The dimensions were: Extreme length, 172 feet; breadth, 41½ feet; draft, 10½ feet; displacement 1000 tons. In almost every respect her constructional features differed fundamentally from the practice of that day, and it is not surprising to learn that the federal naval officers were utterly sceptical as to her value for practical purposes. But Ericsson's faith in his own genius rendered him adamant to criticism and expostulation. In the course of the building and during the trials certain minor defects, mainly due to careless-

* In a letter dated January, 1862, Ericsson wrote: "To the Lords of the (British) Admiralty, the new craft will be a monitor, suggesting doubts as to the propriety of completing these for steel-clad ships at three and a half million (dollars) apiece. On these and many other similar grounds I propose to name the new battery 'Monitor.'"

ness on the part of subordinates, revealed themselves, and the Navy Department desired to replace faulty fittings by others of standard pattern. Ericsson would not hear of it. He made good all the deficiencies in a few days, and when the vessel finally hoisted the flag he had the satisfaction of knowing that she was in every respect his own creation. "The *Monitor* is *mine*," he said, "and no change shall be made." And as Mr. H. W. Wilson observes: "He had designed the ship and all its parts—hull, turret, gun-carriages, engines, and anchor-hoisting machinery, and put into it no less than 40 patentable contrivances. No wonder he called it his." How the *Monitor*, after a stormy passage from New York, in which she nearly became water-logged through the sea pouring down her leaky hatches, arrived at Hampton Roads just in time to prevent the destruction of the Union squadron by the *Merrimac*, and how the two ships fought an epoch-making duel, is a story too well known to be repeated here.

The influence of this engagement on naval construction was hardly less far-reaching than that which the *Dreadnought*, all-big-gun ship, exercised 43 years later. Almost every power began to build monitors, though for a long time designers labored under the mistaken idea that the principle was applicable to sea-going ships, whereas in reality Ericsson had never intended the prototype to be anything but a coast-service vessel. From 1000 tons the displacement rose rapidly, until, in the Roanoke—a wooden frigate converted into a low freeboard monitor—it reached 6300 tons. This, however, was high-water mark, for most of the monitors built in the United States and abroad did not exceed 4000 tons. Notable American exceptions were the *Colossus*, *Massachusetts* and *Oregon*, each 322 feet long, and 6000 tons in displacement. Designed to draw 17 feet of water, they were propelled by twin screws, and were expected to prove thoroughly seaworthy ships. The *Dictator* and *Puritan* were later developments of this attempt to evolve a sea-going ship, possessing all the offensive and defensive qualities of the monitor. They were, in fact, the first mastless ironclads, but their behavior at sea was not such as to encourage perseverance along this line of development, and it was soon recognized that although the monitor was an admirable type for coast service, it was not destined to supersede the battleship for work on the high seas. Nevertheless, that it could on occasion successfully negotiate the open sea was shown by the transatlantic voyage of the *Miantonomoh*. This vessel was 250 feet long and 55 feet broad, her displacement at load draft being about 3900 tons. She was plated with 7-inch armor on the sides and had two turrets. Her engines were not good for more than 9 knots, at which rate of steaming she consumed 40 tons of coal per day. She made the passage from St. John's, Newfoundland, to Queenstown in 10 days, 18 hours, and, according to a narrative of the voyage,* seas were encountered in which an ordinary frigate would have been unable to open her ports," while in the case of the *Miantonomoh*, although the deck was covered with water to a depth of 4 feet with the wind ahead, the sea was so broken by the turret that it was possible to fire in a line with the keel. In a seaway, whether going ahead or with the engines stopped, it was always possible to fire to leeward, and the rolling was described as very moderate. With a following sea the waves were divided in the same manner as when a head sea was encountered, but to windward the ports were constantly submerged. The captain reported that instead of behaving as an ordinary vessel the monitor allows the water to flow freely over the deck—thus imposing a heavy weight on the weather side and causing the vessel to roll to windward. As the sea had to ascend an inclined deck, the greater part of the water rolled off on the weather side." This voyage was considered a most daring and remarkable performance, but it has been far surpassed by that of the two small British monitors, *Severn* and *Mersey*, from England to East Africa in the spring of 1915, for these little vessels were less than one-third the

* Brassey, "The British Navy."

tonnage of the *Miantonomoh*, and had been designed only for river service in South America. The story of their adventurous journey should make entrancing reading when the authorities see fit to publish it.

The armament of the original *Monitor* consisted of two 11-inch smooth-bore guns, firing projectiles of 135 and 166 pounds. Some of the later ships carried a pair of 15-inch smooth bores, using 440-pound shot and 352-pound shell. Against fairly stout armor these weapons made no impression, but the only rifled guns then available in the states had a habit of bursting, and were therefore not often supplied to the monitors, since the effect of such an accident in the confined space of a turret would have been particularly deadly.

Among the European Powers, Russia was foremost in providing herself with a fleet of monitors. In 1864 she launched no less than 12 such vessels, the displacement averaging 1500 tons. Originally armed with muzzle-loaders, at a later date they were fitted with 9-inch Obuchoff breech-loading rifles. Further monitors were built, until by the early seventies nearly a score had been completed for the Russian Navy. "This stupendous fleet of ironclads," as a *Times* correspondent somewhat euphemistically styled it, made a great impression in England, but the truth is that these vessels added little to Russia's sea power, and could never have been employed with safety or effect outside the Baltic. The freeboard of all was very low, the speed of the best did not exceed 8 knots, and the vessels themselves were so badly constructed that a short voyage in heavy weather or even the discharge of their own guns, was generally enough to send them into the dockyard for many months.

In this country the monitor in its original form was never adopted. It was looked upon as essentially a type for coastal navies, as distinct from those which, like the British, were meant to keep the sea at all seasons and in all weathers. Still, in 1879 *The Times* declared that "the American monitors . . . . were certainly the progenitors of our 'Devastation' type." It was not until the outbreak of the present war that we discovered the value of shallow-draft vessels, carrying a few powerful guns, for those inshore operations which have become so familiar a phase of the naval campaign during the last three years. A very successful early example of the type was the *Rolf Krake*, constructed for the Danish Government in 1860 in accordance with the plans of Captain Cowper Coles. Her dimensions were: Length, 185 feet 2 inches; beam, 38 feet 3 inches; draft, 9 feet 2 inches; displacement, 1325 tons. The engines were 750 horse-power, realizing a speed on trial of 7.8 knots. Iron armor-plate 4½ inches thick protected her sides from the upper deck to 3 feet below water. The two turrets each contained a pair of 68-pounder Armstrong guns. In the war of 1864 this little vessel was repeatedly engaged with the Prussian ships and shore batteries, and did great execution against both at small cost to herself. The following extract from the diary of a Prussian artillery officer who was present at the battle of Alsen is of interest: "The Danes certainly have one trump in their hands, and that is the ironclad *Rolf Krake*. All to-day we have been pounding at her and she at us, but whereas we have to deplore the loss of three field guns and many men, our opponent's injuries seem to be limited to a few dents in her armor. We fired over 300 rounds of 24-pounder shot and shell at this ugly sea monster, but for all the visible effect we might have been pelting a crocodile with pebbles. And she in return kept sending us her great shells, which explode like thunderbolts, and rake our battery with hurtling fragments of iron." Moltke, in his "Letters," also alludes to the *Rolf Krake* as that "thick-skinned fellow," against whose ribs the Prussians' 12- and 24-pounder shots rattled loudly but harmlessly.

From 1870 onward the construction of monitors was discontinued in practically every country save America, and even there most of the progress in this direction was limited to the rebuilding of old monitors and the completion of others whose construction had been retarded by lack of funds. The *Miantonomoh* furnished a notable instance of this last-

named policy, and in her renovated state she remained on the active list of the United States Navy down to a very recent date. Other ships which had been lying on the stocks for years, and were finally completed in a form very different from that of the first design, were the *Amphitrite, Monadnock, Terror* and *Puritan,* of which the first two are still on the active list. The cost of completing them averaged about £200,000 per ship, which, in view of their indifferent fighting value under the conditions that prevailed when they finally entered into commission, was undeniably excessive. For coast-defence service, however, they were formidable ships by virtue of their thick armor and powerful breech-loading guns. Several of them took an active part in the Spanish-American War, in which they were used chiefly for bombarding shore defences. The Navy Department at first made the mistake of attaching them to battleship and cruiser squadrons, in which capacity their low speed and poor sea qualities made them more of a hindrance than a help. In view of the fact that naval strategists had unanimously condemned the monitor as obsolete, some surprise was occasioned when, in 1898, the American naval program of that year made provision for four coast-defence ships of the monitor class. Considerations of a political rather than a strategical nature appear to have prompted this measure, for the record of the monitors in the Spanish War had not been such as to justify their perpetuation in modern form. The cost of the new ships, built as the *Arkansas, Florida, Nevada* and *Wyoming*—subsequently re-named *Ozark, Tallahassee, Tonopah* and *Cheyenne* respectively—was limited to £250,000 each for hull and machinery, and as this made very moderate dimensions essential it was found impossible to provide for more than two heavy guns per ship. In explaining the plans, Lieut. Commander Beehler, U. S. N., stated that, compared with the older monitors, such as the *Amphitrite* and *Monadnock,* "the present design, owing to saving of weight in hull and machinery, is superior in speed, in protection, and in every other particular excepting gun power, which is, considered as a whole, only slightly less than in the case of the vessels mentioned, which have four 10-inch guns mounted in two turrets. . . . . The special features of the latest monitor design involve the use of water-tube boilers entirely, the adoption of the most recent designs of balanced turret, high-power 12-inch guns, and the extended application of electricity for turning gear, hoists, ventilating blowers, etc. In the general arrangements many improvements have been introduced, which it is believed will add to the comfort of officers and crew, and to the efficiency of the vessel. The stern has been rounded so as to fully protect the screws, increasing the deck-room at the same time. The state-rooms for all officers, including the captain, are situated on the berth deck. The mess-room for the ward-room officers is arranged in the after end of the superstructure." The following are the dimensions of this class:

Length on load water-line	252 feet
Length over all	255 feet
Breadth, moulded	49 feet 10 inches
Breadth, extreme	50 feet
Freeboard (uniform)	2 feet 6¼ inches
Mean draft (400 tons coal and all stores)	12 feet 6 inches
Displacement (at full-load draft)	3356 tons
Indicated horsepower	1712
Speed	12 knots

The main armament comprises two 12-inch, 40-caliber guns, mounted in one turret, while four 4-inch and some smaller guns are distributed about the superstructure. The axis of the 12-inch guns is 10 feet 1 inch above the water-line. Armor protection is very complete, a belt 11 inches thick extending the whole length of the ship at a depth of 5 feet, reinforced by a 1½-inch protective deck. The turret and barbette armor is 10-11 inches thick, and that of the conning-tower 7 inches. The propelling machinery

consists of two sets of vertical, inverted triple-expansion engines in a single water-tight compartment. Steam is supplied by four water-tube boilers constructed for a working pressure of 250 pounds per square inch. The total grate area is over 200 square feet, the heating surface about 9000 square feet. All four boilers are housed in one compartment, and the uptakes are led into a single funnel. When completed these vessels were assigned to the Atlantic fleet, but they were soon degraded to the reserve, and eventually became tenders to submarines. They are interesting as representatives of the most modern type of monitor in existence prior to the war, and as showing the comparatively formidable armament which can be mounted in a vessel of 3300 tons, in conjunction with robust protection, fair speed, and tolerable nautical qualities. The following table shows the development of the American monitor from 1862 to 1900:

	Original Monitor.	Dictator.	Mianto-nomoh.	Puritan.	Arkansas.
Date of launch.....	1862	1863	1876	1884	1900
Length (feet)	172	312	249	280	255
Breadth (feet)	41½	50	55⅜	60	50
Draft (feet).....	10½	20	14	18	12½
Displacement (tons)....	1000	4500	3990	6060	3356
I. H. P.....	—	1000	1600	3700	1712
Speed (knots)	6	7-8	10½	13	12
Thickest armor (inch)..	8	8	11½	12	11
Armament	2 11in. M. L.	2 15in. M. L.	4 10in. B. L.	4 12in. B. L.	2 12in. B. L.

Turning now to the monitors engaged in the present hostilities, it is naturally impossible to enter fully into details. The *Severn*, *Mersey* and *Humber* were the first vessels of this type to be placed in service for the British Navy at the outbreak of war. They had been ordered by the Brazilian Government from Vickers Limited, and were launched in 1913 as the *Solimões*, *Madeira* and *Javary*, but were purchased by the British Admiralty in August, 1914. The following particulars are summarized from a lengthy description which appeared in the *Navy League Annual* for 1913, and other publications, in connection with their launch: Length, 265 feet; breadth, 49 feet; depth 8 feet 6 inches, with a displacement of about 1250 tons. The designed speed is 11.5 knots, with a radius of action of 4000 nautical miles at economical speed. A double bottom extends almost the entire length of the vessel, providing stowage space for feed-water, oil fuel, etc. This double bottom construction is continued up the sides to the upper deck in way of the engines, boiler spaces and magazines, thus adding to the safety of the ship. The hull, moreover, is separated into a large number of water-tight compartments by transverse and longitudinal bulkheads extending up to a complete steel upper deck, and these compartments form the various store-rooms, magazines, bunkers, auxiliary machinery spaces, etc. The armament consists of two 6-inch quick-firing guns mounted in one armored turret on the upper deck forward, and with electrical machinery for working the guns; two 4.7-inch howitzers on the upper deck aft, four 4.7-inch quick-firing guns on the boat deck, and six machine guns. The sides amidships carry heavy armor, extending from the upper deck to well below the water-line. Forward and aft of this belt armor bulkheads are fitted, and there is thinner plating over the rest of the exposed hull. The upper deck of nickel-steel armor affords protection to the various compartments. Unusually commodious quarters were provided for the officers and crew, and great care was bestowed on the ventilating arrangements, as the ships were, of course, intended to serve

in a district where the climate is extremely warm, and the atmosphere very humid. Fate, however, decreed that these powerful little vessels should receive their baptism of fire in colder latitudes. They formed part of the "scratch" squadron which, under the late Rear Admiral Hood, stemmed the German advance along the Belgian coast, inflicting extremely heavy casualties on the enemy, and causing great damage to his transport and material. Owing to their very light draft the three monitors were able to get well inshore and use their guns almost at point-blank range, until the enemy, by bringing up very heavy artillery, compelled them to keep farther out. In these operations, which unquestionably hampered the German advance to a most serious extent, the *Mersey* was the only vessel to receive important damage. According to Rear Admiral Hood's dispatch, her 6-inch turret was disabled, and she had several hits on the water-line. Ten months later the *Severn* and *Mersey* unexpectedly appeared in the Rufiji estuary, East Africa, where they succeeded in totally destroying by gun-fire the German cruiser *Königsberg*, which had been blockaded in the river for nearly a year.

Of the larger monitors, built specially for the war, it is not permissible to give details, though some idea of their main features was obtained from Mr. Ashmead-Bartlett's letters from the Dardanelles. Jane's "Fighting Ships," for 1916, mentions the *General Crauford*, *Lord Clive*, and other vessels which have been specified in dispatches, and adds the following note: "According to published descriptions, these vessels are high-freeboard, sea-going vessels. Their beam is large, and they are said to maneuver indifferently. It has been publicly stated that 15-inch guns, intended for the new *Royal Sovereign* class of dreadnoughts, were appropriated for arming these ships. The 14-inch guns, ordered in America for the Greek battle cruiser *Wasilefs Giorgios* (ex-*Salamis*), building in Germany, were also purchased for these monitors." Other vessels, presumably of a much smaller type, have been alluded to in official dispatches from almost every theater of the naval war—one, the *M-30*, was reported as sunk by Turkish gun-fire in an admiralty communiqué of June 3, 1916. In certain quarters severe strictures were passed upon the admiralty for having spent so much time, money, and labor on the creation of this fleet of monitors, the critics maintaining that the vessels in question were of extremely limited value. This contention, however, is not borne out by our knowledge of what the monitors have accomplished. At Gallipoli, when the appearance of German submarines compelled the Allied squadron to withdraw temporarily, the position of the invading army, bereft of naval support, would have become highly critical had it not been for the timely arrival of our monitors. Indeed, it is not too much to say that their presence saved the situation. Practically immune from torpedo attack, they were able to maintain a steady bombardment of the Turkish positions with their big guns, and it was largely owing to their efficient work that the evacuation was carried out so successfully. Nearer home the monitors have rendered services scarcely less valuable. No other vessels could have been used effectively against the German fortified positions on the Flanders coast, and without their vigorous and repeated bombardments the enemy would have been able to establish himself much more firmly at Ostend and Zeebrugge than is actually the case. The recent brilliant advance in Mesopotamia, culminating in the occupation of Bagdad, owed much of its success to the fine work of the smaller monitors operating on the Tigris. On the whole, therefore, the admiralty's policy of building monitors has been completely vindicated, and it is doubtful whether their period of usefulness is yet at an end. As a rule, naval bombardment does not give results proportionate to the energy expended, but the novel methods employed both at Gallipoli and off the Flanders coast, where—as has been officially stated—aerial units were employed to control the fire of the monitors, made this form of attack unusually effective. In fact, after the last heavy bombardment of Ostend, it was established by aerial reconnaissance that the Germans had withdrawn all their naval vessels from the port.

For the amphibious operations in which this war has been so prolific the monitor is admirably adapted, and we owe it to the prescience of the admiralty experts in the first few months of the struggle that we possessed these valuable auxiliaries at a period when their services could not well have been dispensed with.—*The Engineer*, 17/8.

RADIO CONTROL VS. TORPEDOPLANE

JAMESTOWN, R. I., August 12, 1917.

To the Editor of the Army and Navy Journal:

During the past six months the suggestion has frequently been made to me, both orally and by mail, that I advocate the use of "John Hays Hammond's System of Wireless Controlled Torpedoes" against the German battleships, submarines, etc. As I am the inventor and patentee of both this scheme and the torpedoplane, I feel warranted in saying that the torpedoplane seems to me the better scheme, and in telling why it seems so. I invented the wireless control scheme in July, 1897, and secured two patents, one for the method and the other for the apparatus, in November, 1900. These are the basic patents on which the system rests.

Alluring as the scheme appears I have never been able to see my way through the maze of practical difficulties that are in the way of its successful application, especially for its employment in simultaneously directing a great number of watercraft or aircraft. When the Wright brothers made their first flight in 1903, a way seemed to be opened for using wireless control; because it was clear that an aeroplane could accompany the torpedo, or other "movable vehicle" (as my patents called it) and either signal back to a transmitting station to steer the "vehicle" to the right or left, or else steer the vehicle directly, by means of a powerful transmitting apparatus on the aeroplane.

I followed the development of aircraft carefully, convinced of their tremendous possibilities for naval work; and in 1911 I had pretty nearly decided to take up seriously the matter of wireless control of aeroplanes and other vehicles from aeroplanes, when the superior simplicity of merely launching ordinary, self-directing torpedoes from aeroplanes occurred to me. All the complications of radio interference, range finding, tracking and communication between many rapidly moving vehicles suddenly vanished; and in their place appeared a plan of the utmost simplicity by which torpedoes could be used as effectively as from battleships, destroyers or submarines, and by which they could be gotten to the place of use more quickly.

At first the thought brought a little personal annoyance; because it seemed sure that so obvious a scheme must have been seen long before by aeronauts and patented. But, after talking about the scheme for more than a year, and being able to find nothing touching it in any aeronautical papers, I finally applied for a patent in April, 1912, and got an absolutely basic patent in July, to my intense amazement.

If anyone will make two diagrams of an attack from the air on the vessels in any naval harbor, one attack by say 100 torpedoplanes and the other attack by 100 wireless-controlled vehicles of any kind, he will see the superior simplicity and reliability of the former. (Of course, a large number of fighting aeroplanes would have to "clear the air" in advance of either attack.)

Aeroplanes are now flying in Europe that can carry three men, three machine guns and 2700 pounds of bombs or torpedoes for six hours at the rate of almost 80 miles per hour; and *they cannot be stopped by mines or submarines.*

B. A. FISKE, *Rear Admiral, U. S. N., retired.*

—*Army and Navy Journal*, 18/8.

OUTPUT OF WORLD'S SHIPYARDS.—New merchant ship tonnage, built during the six months from October, 1916, to April, 1917, amounted to 728 ships of 1,667,524 gross tons, according to figures recently published by the Bureau Veritas. The output in the various maritime countries was as follows:

	Number of Ships	Gross Tonnage
Great Britain	261	680,946
United States	150	484,381
Holland	103	190,619
Japan	46	128,913
France	42	61,988
Italy	20	34,051
Norway	42	34,044
Denmark	20	26,348
Sweden	26	20,023
Spain	7	4,422
Chile	3	823
Russia	5	750
Portugal	3	216
Total	728	1,667,524

Owing to the present increase in shipbuilding in both the United States and Great Britain, these figures will obviously be greatly exceeded at the end of the next six months.—*International Marine Engineering,* September.

SHIP NEWS FURTHER RESTRICTED.—The New York Maritime Exchange's news service has been further restricted in regard to vessels' movements and is now only permitted to furnish information to members who are vessel owners or agents, and then only of vessels owned by them, respectively. Some months ago telegraphic service from Sandy Hook was suspended and rigorous conditions enforced in regard to issuing information of steamers generally. This action so embarrassed vessel owners that strong protests to the Navy Deparment brought some slight relaxation of the order. All were making the best of the situation when the new order was received, which means that marine underwriters will be unable to secure information in regard to vessels they are heavily interested in and further embarrassment will be caused ship supply men and others.—*The Marine Journal,* 1/9.

MACMILLAN FOUND TWO NEW ISLANDS.—A message received by the American Museum of Natural History from Donald MacMillan, the Arctic explorer, who has just landed at Sydney, N. S., after a long stay in the North, in which he established the fact that Peary's Crocker Land was only a mirage, reports further changes which must be made in the map as the result of his explorations.

He has found two new islands, but on the other hand has marked off the map two supposed islands reported by previous explorers, which did not exist. The second largest glacier in the North has been discovered and named American Museum Glacier. In his travels MacMillan found camps which had been inhabited by the expeditions of Sir George Nares in the seventies, Greeley in the eighties, and Peary in the nineties. The telegram follows:

"Arrived this morning at 7.30, 22 days from Etah. Prevailing southerly winds have packed Smith Sound and Melville Bay with drift ice. Bartlett's good judgment and determination brought us through all right. Ship leaking badly, due to constant hammering at ice. Plans for spring work carried out successfully.

"Left Etah March 26 with three Eskimos for exploration and survey of east coast of Ellesmere Land from Cape Sabine to Clarence Head, a

work long advocated by Geographical Society, surveyed only from a ship's deck miles from shore. Naturally its delineation is very inaccurate.

"Due to very severe weather, blinding and drifting snows, we were four days in crossing Smight Sound, open water compelling us to go south by way of Rice Strait. Blocked again at Cape Herschel, I found a way through the mountains into Baird inlet. There, at Eskimo Point, the walls of three stone houses and remains of boat marked the site of the first encampment of Greeley's starvation party.

"Open water at Cape Isabella and an impassable ice foot blocked me completely. Before turning back I searched the cape carefully for records and boat of British expedition of 1876. Was fortunate in discovering records left by Sir George Nares in command of expedition; also mail for H. M. S. *Discovery* and *Alert* left by Sir Allan Young of the *Pandora*. They are legible and in fairly good condition. Mapped Baird Inlet on return.

"Left Etah again May 3 at zero temperature, hoping to find ice in better condition and seals for food. Very little change, open water all down coast. Could not go around Cape Isabella, therefore decided to go over. Climbed the glacier leading over John Ross Mountain. Open water again turned us into Cadogan Inlet and up over glacier back of Paget Point; from here on sea ice, but covered with deep snow. Without good snowshoes trip would have been impossible.

"Between Paget Point and Cape Faraday we discovered a very large glacier which I have named American Museum Glacier, the largest in the North with exception Humboldt. The coast is quite different from the map. Two islands were discovered, one south of Paget Point and one in Talbot Inlet. Lecante Island and Saunders Island do not exist, if reports of early navigators are accepted.

"There has been tremendous glacial activity all along the coast since 1850. The land is fairly buried in ice which is flowing over and around the headlands and filling all the fords. I obtained good sight for longitude, latitude and azimuth at all salient points. Five polar bears and a number of seals furnished meat for dogs and party. On return camped in Peary's old hut at Cape Sabine and visited Greeley's starvation camp on north shore for survey of grounds and photos.

"Since my return to headquarters I have been very busy with ethnology, ornithology and photography. Captain Comer has done excellent work since his arrival one year ago at Etah. I am very fortunate in having such a good assistant. We unload our specimens and collections to-morrow. Expect to leave for New York Tuesday."

It was said at the museum that the explorer expected to arrive in New York on Thursday. His specimens and collections will come later in a special express car.—*N. Y. Times*, 28/8.

CURRENT NAVAL AND PROFESSIONAL PAPERS

UNITED STATES

INFANTRY JOURNAL. **August.**—Uniforms and Badges, by *Major F. R. Brown*. **September.**—German Raid on British Trenches.

JOURNAL OF FRANKLIN INSTITUTE. **August.**—Submarines in Periodical Literature from 1911 to 1917, by *Helen R. Hosmer*.

JOURNAL OF THE MILITARY SERVICE INSTITUTION. **September-October.**—Some Lessons of the War.

SCIENTIFIC AMERICAN. **August 18.**—The Submarine, Problem XII, by *J. Bernard Walker*. Dropping Bombs from Aeroplanes, by *Jean-Abel Lefrance*. **September 15.**—The Submarine Problem (Continued).

THE NAVY AND THE MERCHANT MARINE. **August.**—Winning the War in the Air, by *Augustus Post.* A National Nautical Training School System.

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GREAT BRITAIN

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GERMAN AEROPLANES OVER THE OUTSKIRTS OF LONDON

INTERNATIONAL NOTES

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NAVAL WAR NOTES

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STRATEGY

Digging-Out Tactics, by Percival A. Hislam in the *London Magazine*.—It used to be a favorite saying among the naval writers before the war that "the frontiers of the British fleet are the coasts of the enemy." It is one of those vague and rather high-sounding sentiments that do not mean very much or show much foundation in the facts of history when you come to examine them closely, but it is just the sort of phrase that is popular among those who are forever complaining of what they call the misuse of our naval power.

To most people it is quite a natural and simple thing to talk about "the command of the sea," for they mean by that that one side is able to do more or less as it likes on the high seas, while the other is only able to get its ships there surreptitiously, occasionally, and with the imminent and constant danger of destruction. It will therefore have come as a surprise to many that a number of retired admirals who are dissatisfied with the policy of the navy should, after flinging mud at the admiralty for a few weeks, have suddenly fallen out among themselves as to what they really mean by "command of the sea."

One is content to state that we have the command if we can send our ships anywhere we like in reasonable confidence of their safe arrival. Another replies that we do not command the sea if there is one chance in a thousand of a ship being sunk; while a third—not a retired admiral this time, but a professor of military history at Oxford University—bluntly tells us that we cannot claim the command of the sea so long as the enemy has an armed ship left! If that were true it would also be true that we had never commanded the sea in the whole course of our history—and we certainly should not have any chance of commanding it in the course of the present war. It is about as reasonable an argument as it would be to say that England is not a law-abiding country so long as a single purse-snatcher exists in it.

The idea at the back of these statements is that the navy is not doing the right thing so long as it permits the enemy to exist, no matter what the enemy may do for his own preservation. The real purpose of the fleet, they say, is not to "command the sea" and forbid the use of the sea to the enemy, but to destroy the enemy. It is, of course, a perfectly sound argument and for this reason: If the enemy is destroyed he can have nothing to send to sea and is therefore incapable either of using it himself or of preventing you from using it. In other words, the part is included in the whole, the whole in this case being the annihilation of the enemy's navy.

Now, there is no doubt about two things. The first is that the British Navy is burning to get at close quarters with the enemy, and the second is that with the end of this war the German fleet must be either obliterated or else so restricted that it can never again become a menace to civilization and the peace of the world. But there is another point which we, in our island security, are apt at times to overlook. On one famous occasion, two years before the war Mr. Churchill vastly offended the German jingoes by calling their navy a luxury fleet." What he meant was that the fleet was not essential to the defence of Germany or of German interests; and from that point of view—and that point alone—the mighty British army to-day might be called a "luxury army." That is to say, the British Empire would still be safe from attack and violation if the seemingly impossible should happen and we were to suffer defeat on the continent; but if the navy were to be worsted the allied cause and the British Empire would topple like a stack of cards.

What is the moral of this? It is that, in spite of its own traditions and instincts, we cannot, for the sake of our cause and of civilization in general, allow the navy to run any unnecessary risks—and by the navy I mean, of course, the battle squadrons which form the backbone of our sea power and without which everything else would soon be swept away.

And now we have to consider what is an "unnecessary" risk. We can start out from the position that we want to destroy the German fleet; but it does not follow that it is a necessary condition without which we cannot win the war. A little over 100 years ago the navy was anxious to destroy the fleets of Napoleon, but the fact that we were never able to account for more than about 30 per cent of them did not prevent us from winning that war, and the German fleet cannot prevent us from winning this one unless it succeeds in demolishing the British Navy. If the Germans like to keep their main fleet in cotton wool, that is their lookout. For all immediate and practical purposes we can command the sea just as well with the German battleships moored alongside their quays and dockyard walls as we could if they were lying at the bottom of the sea.

It is still possible that the enemy will come out and make a straight fight of it. Indeed, now that the U-boat is apparently being got under, we may regard such a contingency as distinctly probable, since it leaves the Germans with no alternative even as a forlorn hope. A fight in the open would settle many vexed questions once and for all; but, if the Germans refuse to give us that opportunity, ought we to make their coasts the frontiers of our fleet and proceed to dig them out?

It is a question of balancing the risks against the results to be achieved. The risks are universally admitted to be colossal—so colossal, indeed, that some of those most anxious for this "grand offensive" want us to build an altogether new navy, designed on new principles (which they describe only in vaguest terms), especially to carry out this operation. Others would be content for the grand fleet to take on the job.

Leaving the Baltic out of consideration for the time being, the German coast consists of two sides of a triangle lying behind the island of Heligoland and bounded on the southwest by the island of Borkum and on the northeast by (approximately) the island of Sylt. From Borkum to Heligoland is 60 miles and from Heligoland to Sylt another 50; and behind this

short and easily defended line are the war ports of Emden, Wilhelmshaven, Bremen, Cuxhaven, and Brunsbuttel, which is the North Sea outlet of the Kiel Canal.

The whole bight of Heligoland is thickly mined, and the chances are that the passages through the mine fields are known only to the Germans. The first movement in any "digging-out" attempt on our part would be to remove the mines, for which purpose we should presumably send in the usual mine sweepers. The Germans would promptly send out their destroyers to get rid of them; and, as sweepers are not built to fight, we should send in our destroyers to protect them. The Germans would then send light cruisers to deal with our destroyers, whereupon, of course, in go our light cruisers. This game of beggar-my-neighbor would go on until the Germans sent out their battleships—not, be it remembered, out into the open, but only far enough through the mine fields for their guns to be able to drive off the force detailed to protect our mine sweepers.

What do we do to counter the German battleships? Do we send in our own to steam to and fro along the edge of the enemy's mine field and within 50 miles of his submarine bases? It does not sound very feasible, and I do not imagine there lives a naval officer sufficiently hare-brained to play such a game with the force upon which civilization is depending for the defeat of Germany. It is true that on more than one occasion a powerful German cruiser force has raced across the North Sea, fired a few shells into Scarborough, Lowestoft, or Yarmouth, and returned without suffering any loss from our submarines or mines; but this "tip-and-run" sort of excursion is a vastly different business from settling down to remove from the enemy's coast a mine field some hundreds of square miles in extent, subject to the constant attack of ships of all descriptions, and, in all probability, with the enemy's submarines laying fresh mines as fast as the old ones were trawled up.

Suppose the seemingly impossible happened and that in due course—and after paying the due price—the mine fields were removed. The next thing is to get at the German fleet and destroy it, and the German fleet, naturally enough, does not want to be destroyed. It therefore remains within the shelter of the coastal fortifications.

When you speak of a German naval base I hope you never get into your mind's eye a picture of a place like Scarborough or Blackpool or Yarmouth, dumped down on the edge of the sea. Those who know the position of our own dockyard at Chatham will be able to form a pretty accurate picture of such German bases as Wilhelmshaven, Bremen, Brunsbuttel, and Kiel. To reach Chatham from the sea you have first to steam up the Thames Estuary as far as the Nore, and from there you have to make your way up the tortuous Medway for some miles before sighting the dockyard. That is the German principle, with the added fact that the whole coast is defended by concealed guns of the most powerful type, and with subterranean and submarine torpedo stations from which dirigible torpedoes can be launched against any ship in the fairway.

Brunsbuttel and the Kiel Canal exit, for instance, lie about 30,000 yards (17 miles) beyond Cuxhaven, up the Elbe. The guns of Cuxhaven have a reach of 25,000 yards seaward, and the navigable channel from that place up the river is nowhere more than a thousand yards in width, with every inch of it dominated by heavy guns.

One has only to recall the Dardanelles fiasco to imagine within a little what a naval attempt to force the lower reaches of the Elbe would be like. The Dardanelles was defended on the German system—with heavy Krupp guns in concealed positions and with invisible stations ashore from which torpedoes can be fired and guided towards their quarry, while drifting mines thrown into the current can at any moment face the attacking ships with, perhaps, the greatest peril of all. The Allies lost six battleships, sunk in the Dardanelles operations; but this is what happened on one day (March 18, 1915) when the fleet tried to force its way through, the details

being taken from Mr. Walter Roch's memorandum in the first report of the Dardanelles Commission:

Irresistible, British battleship of 15,000 tons, sunk.

Ocean, British battleship of 12,950 tons, sunk.

Bouvet, French battleship of 11,843 tons, sunk, with nearly the whole of her crew.

Inflexible, British battle cruiser of 17,250 tons, badly damaged.

Gaulois, French battleship of 11,088 tons, badly damaged and had to be run ashore.

Suffren, French battleship of 12,526 tons, badly damaged and had to be docked.

In addition to these the French battleship *Charlemagne* had her stokehold flooded, and three other British ships were more or less knocked about; the *Albion,* for instance, having her fore-turret put out of action for some days.

All this happened in a few hours in an attack in Turkish waters. What does any sane person think would happen if we sent in the grand fleet to try a similar maneuver in the Elbe, with the Kiel Canal as its objective instead of Constantinople? Is there the faintest suspicion of a doubt that the expedition would end in the most ignominious failure and the direst disaster? There surely cannot be two opinions on the point—and there is certainly nothing whatever in the situation, either ashore or afloat, which would justify us in accepting the terrible sacrifice and the decimation of the fleet that would be involved.

People—even very distinguished people like Lord Sydenham—ask us if our naval heroes of the past, like Drake and Nelson, would have been content with the policy of "watchful waiting" that is the keynote of the grand fleet strategy to-day. Well, so far as Drake is concerned, it is true that he went down to Cadiz in 1587 and "singed the King of Spain's beard," but he neither broke the power of Spain nor prevented the sailing of the Armada. It is also quite certain that if Drake had kept his fleet off Cadiz, and waited for the Spaniards there instead of letting them get into the Channel before he set about them, the Armada would not have met the overwhelming fate that actually befell it.

As for Nelson, who ever heard of him trying to dig the French fleet out of Toulon? He was not such a fool as to pit his ships against forts—and he had neither mines nor submarines to worry about. At the Battle of the Nile he did sail in and attack—and all but destroy—the French fleet as it lay at anchor, but in the first place the harbor was undefended, and, in the second, the circumstances were such as fully to justify him in taking any risk. The French Army was in Egypt, and Nelson's sole object was to cut off its communication with France. It was an urgent and vital matter. It would have justified Nelson in losing the whole of his own fleet provided he could at the same time have destroyed that under Admiral Brueys. That he succeeded at very small cost is a tribute to his genius and the capacity of those under him, but the essential point is that he balanced the risk against the result and acted accordingly.

If there were anything great to be achieved by digging out the German high sea fleet the task might be attempted. If the U-boats were so near beating us that the destruction of their bases remained the only remedy, then it would be perfectly right and proper for the grand fleet to expend itself, if need be, in an attempt to destroy those bases. Only a few weeks ago it was urged that this was the actual position at sea, but now we know better. We know that we can get the better of the submarine without throwing away the grand fleet, whose business is not to fight submarines but to hold the sea against the best the Germans can send to challenge it.

Do not let us worry about the strategy of the grand fleet or pay too much attention to the views of admirals, long since pensioned, who never in their lives were given the opportunity of commanding a fleet. It is a

remarkable thing, but a true one, that there are thousands of people up and down the country who would willingly confess their inability to run a butcher's shop, or drive a motor car, or tell you how many feet of water there are over the Dogger Bank, who are, nevertheless, confident that they could handle the British Navy better than those who are doing their best with it to-day, and who have been studying the problem of naval warfare since they entered the Britannia at the age of thirteen.

Officers and men in the grand fleet are impatient to "get at" the full naval forces of the Kaiser, but so long as those forces cling to shelter, what could our men usefully do? Experts and retired admirals tell us that we cannot expect to command the sea without fighting for it; but the grand fleet's complaint for the last three years is that there has only once been anyone to fight, and then the enemy was only intercepted by accident off Jutland Bank, within a couple of hundred miles of his bases, to which he returned at top speed.

People who think the navy has deteriorated because it isn't always fussing around and giving pyrotechnic displays have not taken the trouble to get hold of the rudiments of their own history. Our last war with France stretched, with a brief interval, from 1793 to 1815, and in those 22 years only three big naval engagements were fought with the French. The idea that sea power is a battering force is false. You can choke the life out of Germany with the strangle-hold, but you cannot punch it out of her by foolishly trying to bombard the Kiel Canal.—*Army and Navy Register*, 1/9.

BRITISH NAVAL STRATEGY.—For several months past a lively correspondence has been going on in *The Times* and other journals on the subject of our naval policy generally, and North Sea strategy in particular. Many retired naval officers have contributed to the discussion, as also has Mr. Winston Churchill, who as a former First Lord of the Admiralty is entitled to an attentive hearing. In some circles, it appears, a feeling prevails that the navy is not being handled with the boldness and energy demanded by the situation. The critics ask why our naval forces, with all their incomparable resources in men, ships and guns, do not take the offensive and attempt to get at the enemy; and, above all, why no attempt is made to strike at the root of the submarine evil by sealing up or destroying the raiders in their lair? The management of naval operations, say the critics, is in the hands of certain officers who are constitutionally averse to taking risks, and who, therefore, impose a veto on any and every plan of aggressive action which aims at seeking out the enemy instead of placidly awaiting his good pleasure. The prolonged controversy to which we have alluded has tended to cloud the fundamental issue, which is simply this: Is it possible for the navy to undertake, with a reasonable prospect of success commensurate with the hazards involved, a great offensive against the coast strongholds of the enemy, with the purpose of destroying his battle fleet and putting an end to the submarine *guerre de course* by barricading every channel through which the U-boats enter or leave? The fact that no attempt has been made in this direction indicates that in the judgment of the Admiralty an operation of this character is not feasible. It may, therefore, be worth while to set forth the principal considerations which have, doubtless, led the Admiralty to decide against a naval offensive.

Irrespective of attack by air, there are two methods by which the naval bases of Germany might be assailed—namely, by naval bombardment alone, or by a fleet attack in conjunction with a military landing. Of the results likely to attend the first method we had an example at the Dardanelles. Those impatient people who urge the navy to "take the offensive" are loath to admit a parallel between the conditions which ruled at the Dardanelles and those which would be encountered in the event of a grand-scale attack on the German coast. In this they are prudent; for if the difficulties that foiled the naval attempt to force the Dardanelles were multiplied tenfold, we should gain some idea of the task that would confront the fleet

in a similar enterprise against, say, Wilhelmshaven or Cuxhaven. The allied fleet at Gallipoli had to deal with shore defences that were partly obsolete and partly improvised. Of the many big guns mounted, only a small percentage were of modern pattern. The majority of the garrison, it is understood, were Turks, with a sprinkling of German artillerists in charge of the more important technical posts. Ammunition for the guns was none too plentiful, and there was a scarcity of the mines and torpedoes on which reliance was mainly placed for barring the Channel to the Allies' ships. Yet the great attempt to force the passage on March 18, 1915, broke down with losses which, heavy as they were, came within an ace of being much more serious. In spite of a vast expenditure of ammunition by the ships, the principal defences ashore suffered negligible damage, only the exterior forts of Kum Kale and Sedul-Bahr being laid in ruins. The batteries commanding the Narrows suffered hardly at all, though in an effort to silence them the British and French battleships had braved the mine-fields and engaged the enemy under a cross-fire at almost point-blank range. On that historic day the handling of the allied fleet was a marvel of audacity and determination. But the task that had been set was an impossible one, and the meager results obtained cost the Allies three battleships, to say nothing of serious damage to other units of the squadron. The defences which guard the German North Sea coast are admitted to be exceptionally strong. Millions of money and infinite labor were spent on them during the 10 years previous to the war. They literally bristle with guns of maximum range and power, mounted in emplacements of armor and concrete which are proof against the heaviest bombardment, and in most cases the battery positions are so cunningly hidden as to be quite invisible from the sea. They are manned by the "Matrosen-Artillerie," a highly trained corps which specializes in the working of heavy coast guns. Furthermore, there are formidable auxiliary defences in the form of mine-fields, shore torpedo stations, and destroyer and submarine flotillas assigned for the protection of each base. Nor is it only these elaborate artificial defences which make the German seaboard so difficult to approach. The coast itself is infested with shoals and sandbanks to an extent that renders navigation extremely difficult even in normal times. In war, with lights extinguished and booms and buoys removed, only consummate seamanship and a generous measure of luck could save large vessels from disaster in these treacherous waters. To make any impression at all on the strongholds where enemy submarines find refuge, the attacking fleet would have to consist of powerful modern ships, armed with the heaviest long-range guns. A "scratch" squadron such as that which assembled at the Dardanelles would be worse than useless. Old ships are consequently ruled out, for their guns would be hopelessly out-ranged by the 45- and 50-caliber, high-velocity pieces which are known to be mounted in the German shore batteries, and their protection is inadequate to withstand gun-fire of this description. This debars our pre-dreadnought "surplus fleet," which the advocates of an offensive policy are so eager to sacrifice. As for the new monitors, they are useful enough in certain operations, but we venture to doubt whether their designers ever intended them to be employed against defences as formidable as those which protect every vulnerable point on the German coast. In any case, the limited number of heavy guns they carry prevents them from maintaining that volume of fire which is absolutely essential to the success of an operation such as we are discussing. It seems, then, that to be effective the bombarding force would have to be made up of super-dreadnoughts—in other words, the grand fleet would have to yield up some of its very finest ships. We leave it to the critics of the admiralty to decide whether or not it would be sound policy to deprive the grand fleet of some of its most powerful units at a time when the enemy's battle squadrons, of whose exact strength we have no certain information, are still intact. If, after negotiating the mine-fields and escaping the torpedoes launched by submarines and destroyers, the attacking

force got within range of, say, Cuxhaven, and completely silenced the outer batteries—a most improbable contingency—how could it follow up its advantage? The locks of the Kiel Canal would be a tempting objective, but unfortunately they are situated 17 miles higher up the river Elbe, and the channel, which can be navigated by deep-draft ships only on a flood tide, is commanded at several points by further powerful batteries, and, in addition, would undoubtedly be mined. Probably, therefore, the fleet would have to withdraw after silencing the outer forts, and in a week or less the enemy would have thrown up new defences quite strong enough to keep ships at a respectful distance. And Cuxhaven, be it remembered, is only one of many bases, each of which would have to be dealt with if the object was to blockade the submarines. Many people seem to think that the activity of the raiders would practically cease if Ostend and Zeebrugge were sealed up, but we fear this is a delusion. To reach the Atlantic and the Channel they would simply go "north about" Scotland, as, in fact, many of them have done from the beginning. Stated in terms of hard fact, the "naval offensive" of which so much is heard becomes a singularly unattractive proposition, which would inevitably lead to severe losses, with no prospect of solid gains to balance them. *Un canon à terre vaut un vaisseau à la mer* is an axiom that applies with special force to-day. That there is scope for improvement in the measures now being taken to cope with submarine piracy may be true, and it is possible also that opportunities have been lost of dealing the enemy shrewd blows by sea and air. But it is quite another matter to censure the admiralty for its reluctance to split the grand fleet and squander men and ships on an enterprise which, we are convinced, would be condemned as impracticable by an overwhelming majority of the officers who are now serving afloat.

This somewhat clamant agitation for a naval offensive is, moreover, to be deprecated for reasons other than those we have cited. It is based on the assumption that the naval policy we have followed during the last three years has been more or less without decisive effect on the issue of the war as a whole. We fail to understand how anyone cognizant of the facts can arrive at such a conclusion. The tremendous influence of sea power has never been displayed more convincingly than in the present struggle. It is sea power alone which has enabled the Allies to keep in the field with steadily growing strength, to bring the resources of the whole world under contribution, and to amass those vast reserves of men and material which must ultimately place the military supremacy of the Allies beyond dispute. It is sea power, again, which is remorselessly sapping the vitality of the Central Empires and reducing them to economic impotence. Faulty as some allege it to have been, the naval blockade has proved wonderfully efficacious in fostering war weariness in Germany and Austria and diminishing their powers of endurance. We have, in truth, derived such incalculable benefit from our mastery of the waters as to make the influence of sea power on the wars of the past seem insignificant in comparison. The demand for a naval offensive—in other words, for a course of action which must inevitably jeopardize our supremacy—is strangely ill-timed at a moment when, owing to the intervention of the United States, the Allies are in a position to make the blockade far more stringent than was hitherto possible. Germany asks nothing better than that we should send our warships against her impregnable coast defences, and she still clings desperately to the hope that irresponsible agitation in this country will eventually compel the naval authorities to depart from the sound policy they have pursued up to now. We are confident that she will be disappointed. We note with satisfaction that Sir Eric Geddes has expressly disclaimed any intention of interfering with the strategical operations of the fleet and will follow the example of his predecessor in leaving these matters entirely in the hands of his professional advisers. That they are very capable hands will, we think, be admitted by most people after an impartial review of the naval history of the last three years.—*The Engineer*, 17/8.

WARNS OF NAVAL RASHNESS

To the Editor of The New York Times:

In your issue of August 27 there appeared the following dispatch from Paris:

"Paris, August 28.—Military authorities here strongly favor a more aggressive policy on the part of the British Navy in attacking German submarine bases. It is argued that if such an objective is worth a military offensive from Verdun to Flanders, costing hundreds of thousands of casualties, both the British and American fleets should go in fearlessly and destroy the U-boat nests in Belgium."

This voices from France the suggestion, made here recently, that our navy, with or without that of Great Britain, be sent forthwith into the German's mouth to pull his teeth. To the civilian, perhaps to the army man, it may seem a practicable undertaking at the present time to send an American naval expedition against Germany's Belgian bases. So appeared the disastrous naval attack upon Turkey—in advance of the lesson it taught.

As the suggestion from Paris may gain a fresh foothold here, and give rise to a newspaper campaign on behalf of its acceptance, it would seem to be wise to point out promptly the following facts:

First, our navy at present is in the soft shell state. It is a nursery, not a fighting establishment. It is hard at work digesting great drafts of green men, who must be taught in a jiffy what it required the personnel of the navy years of hard study and practice to learn.

A naval fight is a sea game, in which an untrained and unhardened team can no more stand up against professionals of long experience than could a team picked from the bleachers stop the Giants. To put a schooling navy up against the hardest naval job known—that of reducing a fortified land position—could result in nothing but a useless slaughter of the innocents, the destruction of unreplaceable equipment of vast international importance, and an increase of Germany's relative sea strength equal to our losses.

Second, such an undertaking requires especially designed equipment, needing months for its preparation. Without this, and suitable air and land supports, the project would be an exhibition of madness. The new instruments required are not yet at hand, nor is the navy's aerial arm even begun upon such a scale as would enable it to administer to the Belgian bases, by means of a swarm of seaplanes, a sufficient anesthesia to permit the fleet to engage in a successful operation.

Third, a navy is the world's most intricate fighting machine. Those only understand it who from boyhood have swum in and grown up with its kaleidoscopic problems; no others are competent to say how, or where, or when, precisely, it should be used.

No civilian, nor even the wisest secretary who ever has sat in the navy's chair, ever was or is competent to mold its strategy, or to guide its tactics. As safely might the boy who climbs into the empty cab of a locomotive handle the levers he finds before him. Such a boy was Churchill at the Dardanelles. One Churchill is enough.

Therefore, we should give the navy its head, and keep the civilian's hand out of its professional problems. We should feed it lavishly with men, new equipment and supplies, and furnish it at once with an enormous—I use the word advisedly—aerial counterpart of itself. Its strategy and tactics we should leave exclusively in professional hands. But at all times we should insist upon knowing that its plans are its own, and have been made by its ablest minds.

Having faithfully done these things, then, and then only, shall we be entitled to expect of our navy achievements commensurate with its glorious traditions. That they shall be forthcoming not an American doubts.

HENRY A. WISE WOOD.

New York, August 30, 1917. —*N. Y. Times*, 1/9.

HOLDING FLANDERS.—German annexationists who are insisting that possession of the coast of Flanders is absolutely necessary for the security of Germany's future on the sea are subjected to sharp criticism by Captain L. Persius, the well-known German naval writer. Taking up the Pan-Germans' assertions, in a recent number of the *Berliner Tageblatt,* Captain Persius says:

"From the moment that discussion of war aims was permitted I have defended the view that only through a compromise peace could the unhappy rending to pieces of the nations be brought to an end; that is, that no involuntary separations of territory of any kind could be demanded, as that would merely sow the seeds of fresh strife. The Imperial Chancellor had already declared among other things, on November 9 of last year, regarding Belgium: 'In the discussion of our war aims I have never declared it to be our intention to annex Belgium.'

"But it would be misjudging the sentiment prevailing in some sections of the German people not to recognize that, despite the flat disavowal of the annexationists by the government, there are still wide circles who do not want to give up the idea that Belgium must remain in German hands. Especially will there be widely felt a certain sentiment of disappointment at the time when the German flag disappears from the coast of Flanders. Regarding the value of this coast for the security of Germany on the sea there has been such a strong agitation, both oral and in print, that it is no wonder that public opinion is somewhat one-sided. Now, since a calmer estimate of the war situation begins to make itself felt, it is in the interest of the nation to direct this rather one-sided appraisement of the value of Flanders for German sea power back to the proper dimensions.

"It must be understood in advance that the following observations, *sine ira et studio,* try to be just regarding the advantages and disadvantages of the possession of the coast of Flanders, but that their inspiration was by no means found in the French proverb: 'If you do not have what you love, you must love what you have.' In general, those through whose veins the annexation fever perhaps beats too hotly should remind themselves that often 'a little more' signifies that acquisition of land may become a hindrance, indeed a danger, to the development of their own state if they are not in a position closely to amalgamate the newly won land with the old territory.

"The friends of annexation advance as reasons for their demand that German power at sea would be strengthened through possession of the Flanders coast. The closer the Germans moved their naval base toward the British Isles, the greater would be the pressure they could exercise upon England. They emerged from the unhappy 'wet triangle' and thus conquered the 'freedom of the seas.' The answer to this is: There exists some not unimportant differences of opinion as to what is meant by 'making good on the sea,' particularly as to what degree of such sea power is necessary for the individual states.

"Assails Mahan's Conclusions.—The North American Rear Admiral Mahan, with his well-known book, 'The Influence of the Sea Power on History,' created some confusion, especially in brains adversely affected by chauvinism. It must be noted that the longer the war lasts the stronger the evidence becomes that Mahan overshot his mark a little as he spread the doctrine of the overwhelming significance of sea power upon the history of the nations. In his day he found zealous admirers, especially in Germany, who, suspending their powers of judgment for the time, overlooked the fact that he spoke as an American to Englishmen, that he did not scruple occasionally to do violence to history when it appeared necessary to make his evidence fit, and that he one-sidedly treated British successes at sea as the standard; that, in short, he created a generalized picture that could not stand real objective examination.

"If Mahan had been able to follow the course of this war—he died soon after it began—he, too, might have had doubts, caused by the part played

by the U-boats, whether the dominant sea power really is still in a position to talk about its unlimited rule. Formerly the strength of a seafaring people was chiefly based upon the ships of the line and armored cruisers operating on top of the water, therefore upon the very ships that to-day, for fear of falling victims to attacks by U-boats, prefer to remain, for the greater part, in port. When we think of the progressive development of the U-boats, both as war craft and underwater merchantmen, in its last analysis, we cannot wave aside the necessity for a revision of the ideas regarding the individual component parts of sea armament.

"But also aside from such a limited comprehension of the domination of the sea, it is undisputed that sea power above all bases itself upon floating tools of strength. Of course, equipment bases, etc., for warships are necessary. The safer the position of such bases the better. Now, the Germans have a coast on the North Sea that could not be more ideally imagined for purposes of defence. Along its points, already strongly defended by nature, lie the supporting bases of the German war fleet, and these at the same time partly represent the most important ports of the German merchant marine.

"The views regarding the formation of the German North Sea coasts in connection with their worth for purposes of maritime warfare have changed in the minds of the annexationists. On December 1, 1915, a Hamburg newspaper printed an article containing the following words: 'The peculiarly unfavorable formation of the German North Sea coasts.' Nevertheless, the author of the article talked on October 2, 1909, about a 'notably favorable formation of our North Sea coasts,' and in 1908 he wrote: 'Nature meant well with the German coasts; she made them very hard to approach. Low shores, with islands in front of them, sandbanks, muddy shallows, and between them powerful currents with shifting courses, make it hard for even the German seamen to find the right course, if, as it would happen in time of war, lighthouses, buoys and other marine signals are removed.' In these sentences the writer admirably described some years ago the formation of the German coast, while now, under the influence of the annexationist idea, he distorts the truth.

"*Disadvantage of Long Coast Line.*—Furthermore, it must be remembered that the sea power of a kingdom by no means always gains by the seizing of bases of support, etc. What is adapted to the most powerful fleet does not need to be demanded without further consideration by other fleets as being in their interest. The first will try, whether with reason is yet undecided, for instance, to establish bases on all the oceans from which its armed forces can injure the enemy's commerce. These bases will not worry much about attacks by the weaker fleet. All nations, however, with lesser sea power that have colonies and naval bases far from the motherland are bound to be in continual worry, in case they do not understand either how to get along with the power possessing the strongest fleet, or how to insure their security against the strongest fleet through forming alliances with other nations disposing of sea power. We may point to the war of 1898 between the United States and Spain, during which the weak Spanish fleet was as little able to defend the West Indian possessions against the strong North American fleet as it was the Philippines. Besides, we may think of the continual uneasiness in which Holland finds herself on account of her East Indian possessions, upon which Japan has turned a covetous eye. And, finally, the United States would be happier if the Stars and Stripes did not wave over the Philippines! Japan's insatiable impulse toward expansion also creates permanent worry there.

"The German North Sea coast has always had the reputation of having been made almost unassailable by nature. By the addition of forts and mine fields in the Weser, Elbe and Jade, and especially at Heligoland, a system of defences has been created that could not be better planned, and that is now standing the test of war most excellently. Almost all of Germany's colonial possessions, with Kiao-Chau at the head, which had been

developed into a naval base at considerable expense, fell into the hands of the enemy—the enemy that disposes of the strongest naval power.

"The possession of more coastline in Europe would entail more means of defence. Of course, the Flanders coast, as we now see, is not difficult to defend. The French paper *Le Journal* wrote recently regarding the question as to why the supporting bases of the German U-boats on the Flanders coast had not yet been destroyed: 'Unfortunately, the English fighting ships when they approach the coast find themselves under the fire of the German batteries before they are able to fire themselves. Often English monitors have suffered severe damage through an effective fire at a distance of 38 kilometers.' This verifies the old axiom: 'A cannon on land is worth three on deck.'

"The possession of the coast of Flanders, assert the annexationists, pushes Germany directly toward England, the principal enemy. This is undoubtedly true. But is this of service to the Germans under all circumstances? In the same measure as the Germans draw nearer to England, the others draw nearer to Germany, too! The ideal situation of the German supporting bases on the 'wet triangle' is not offered to the high seas fleet on the Flanders coast. Besides that, it is worth while remembering that the construction there of somewhat useful bases of support would swallow up pretty large sums. Conditions are similar to those at one time prevailing at Wilhelmshaven, where fresh millions were always required for meeting the danger of new sandbanks. Will the Germans be able to raise the necessary sums after this war? Furthermore, the champions of annexation assert that through possession of the Flanders coast the Germans would get out of the 'wet triangle.' At present it is impossible for German merchantmen to reach the Atlantic Ocean, because they would have to pass through the English Channel and the Straits of Dover-Calais. 'Out of the wet triangle' would at the same time mean winning 'the freedom of the seas.'

"It is difficult to follow such bold flights of thought and to remain serious. If there were no superior British fleet the German merchantmen would be free to-day to steam out of Bremen or Hamburg on a somewhat north-northwesterly course and after a few hundred miles through the North Sea pass through the narrowest point of this voyage between the Orkney Islands and the coast of Norway—more exactly, between the ports of Kirkwall and Haugesund—before they swung off to the west and steered into the open Atlantic. The narrowest point on this trip to the Atlantic Ocean is 220 miles. On the contrary, the widest points in the English Channel at its western mouth, if we omit the Dover-Calais Straits, is between the Lizard and the Isle of Ouessant, (Ushant). It measures only 85 miles. If a merchantman wants to get into the Atlantic Ocean southward from the Flanders coast it must first pass through the Straits of Dover-Calais, which are only 24 miles wide, and then make a long trip through the very narrow English Channel before it gets into the open sea. Which route is to be preferred? If the Germans want to get out of the 'wet triangle' they would have to annex the French coast, including Brittany, and therefore the naval ports of Cherbourg and Brest. Besides, Brest lies further south than Paris! Consequently the possession of the Flanders coast has nothing to do with the desire to escape from the 'wet triangle'—a desire which, as is evident from the foregoing, is unauthorized.

"Therefore, the Germans would only get out of the 'wet triangle' if they were to conquer and hold the whole of Brittany. If the great mass of the German people would keep this incontrovertible fact before its eyes a wholesome check would be administered to the agitation for the possession of the coast of Flanders by the unterrified annexationists—something that ought to be welcomed by every practical statesman as in the interest of facilitating an early conclusion of peace."—*N. Y. Times*, 23/8.

GERMAN PLANS CHANGED.—Official information received in Washington is to the effect that the entrance of the United States into the war has caused great changes in the German plans for her submarine campaign. After furnishing Austria with a sufficient number of submarines for that nation's needs, Germany has withdrawn entirely from the Mediterranean and is concentrating every effort upon the object of stopping British, French and American troops and supply ships in the Atlantic and North Sea. A diminished number of submarines of German build, but manned entirely by Austrians, are in service in the Adriatic and Mediterranean, but their offensive operations have been greatly curtailed. Italy maintains large fleets of submarine chasers and holds this weapon to be only inferior to destroyers and airplanes in combating submarines.—*Shipping Illustrated*, 25/8.

ATLANTIC

NORWEGIAN SHIP USED AS DECOY.—Twelve members of the crew of the Norwegian steamship *Benguela*, who arrived August 15 on a Spanish liner at an Atlantic port, told how the German submarine commander used their vessel as a decoy for 16 days before he finally sunk her off the Irish coast on July 14. According to the sailors, the *Benguela* was attacked early on the morning of June 28 by a U-boat of the latest type, which fired a shot across her bows. After the captain had stopped the engines and told the chief officer to have the two lifeboats lowered away, he received orders from the submarine commander to stand by with his men while the *Benguela* was examined. This inspection occupied over an hour and the German sailors took away two boatloads of provisions.

The crew of the steamship, who had been lying off on their oars, waiting for permission to row away, then were told to return to their ship. They were accompanied by 10 armed Germans under the command of two junior officers, also carrying rifles and revolvers. The captain of the *Benguela* was instructed to steam after the submarine, and if the latter craft was compelled to submerge, he was told the two officers would take command and instruct him what to do under the circumstances.

Day after day the steamship and the submarine, which was just awash on the starboard side, cruised about, waiting for merchantmen to appear, but none came. The German commander sent out frequent S. O. S. calls for aid by wireless from the decoy ship, but did not receive a single response.

On July 14 the *Benguela* had worked down toward the Irish coast from the north of Scotland, and the submarine commander decided that he was wasting time and would do more work without the aid of the Norwegian steamship. Bombs were placed in the hold of the *Benguela* and the crew were told to jump into their boats and row away as fast as they could. They got clear just before the bombs exploded and the freighter went to the bottom. Three hours later the crew were rescued by a British destroyer.

The Norwegians said that the U-boat was about 1700 tons gross and was built in 1915 at Stettin. She was about 275 feet long, had two 3-inch guns on deck and carried a crew of 70 men. The commander told the captain of the *Benguela* that he and his men had been away from their base for five months. During that time they had been operating around the British Isles and obtained provisions and fuel from the vessels before they sank them. New supplies of torpedoes and bombs were sent to them from Zeebrugge by old submarines of a smaller type.

The same Spanish steamship brought five members of the crew of the Norwegian bark *Saraa*, which was sunk off the Azores on June 29. The crew of the submarine saw a hog in a pen on the main deck of the bark near the galley, and in their haste to seize him they let the porker go. He ran squealing around the decks and dashed through the galley followed by the hungry German sailors, who finally captured the pig in the forecastle

and took him on board the submarine, much to the relief of their commander, who had been signaling frantically for their return, as a warship was in sight on the horizon steaming very fast toward their craft. The *Saraa* blew up and was scattered over the surface of the sea and the U-boat was submerged. The crew were taken on a fishing steamship to a port in Spain.—*N. Y. Times,* 15/8.

U-BOAT REPORTED SUNK WITH BOMB.—A gun pointer in the United States Navy, now on duty on an armed merchantman, writing to his mother here, describes an adventure with German submarines in the war zone on a voyage about the middle of July. On the ninth day out a submarine suddenly came up beside the merchantman, too close for use of its deck guns or torpedo tubes. The naval gun crew also was unable to attack, but a member of the gun crew picked up a bomb and dropped it on the submarine, causing an explosion which sank the enemy.

The merchant ship was under convoy of a cruiser and on the day following the attack the cruiser was attacked from both port and starboard simultaneously by submarines. The torpedoes passed astern of the cruiser and a salvo from both sides of the cruiser at the two submarines caused both to submerge.—*N. Y. Times,* 19/8.

U. S. SUBMARINE SINKS AT HOME PORT.—The Navy Department made the following announcement September 15:

"A United States submarine sank at her dock at an Atlantic port yesterday morning (September 14). The cause has not yet been determined. There was no loss of life, and it is expected that she will be raised in a short time, when the full report will be made to the Navy Department."

Further than this the department did not care to make any statement. It was particularly anxious that the name of the port should not be published.

Since the United States entered the war the Navy Department has suppressed orders to officers and the official lists giving the names of the officers attached to war vessels. No information is available, therefore, as to the commander and other officers of the submarine that sank.—*N. Y. Times,* 16/9.

U-BOATS ATTACK IN FORCE.—The Navy Department on September 11 published the following statement: "The Navy Department has received a report from Paris which states that the steamer *Westwego* reported on September 8 that while cruising with several other ships it was attacked by a massed force of six submarines off the coast of France on September 5; the result of this attack being that two of the steamers attacked were sunk, and probably one of the submarines was lost."—*Army and Navy Journal,* 15/9.

U-BOAT COLLIDES WITH LINER.—The officers of a British freighter which arrived at an Atlantic port brought the news of the sinking of one of the latest types of German U-boats by gun-fire after a collision with their vessel off the coast of Ireland on the eastward voyage to a port in England.

"It was about 3 o'clock in the afternoon," said one of the senior officers of the ship, "and we were about 125 miles off the Irish coast steaming along at about 13 knots in clear weather and calm sea. Just after six bells struck, the lookout man at the foremast sang out: 'Submarine right under the starboard bow!' The captain and myself were on the bridge at the time and we rushed over to starboard just in time to see a big U-boat coming to the surface. She hit us a hard glancing blow on the bluff of the bow of our ship, which carried away her periscope and started her leaking from the impact.

"Blinded and helpless, the submarine was swung by the water thrown from our bow to the starboard side and grated along toward the stern.

"In the meantime the captain had sent word to the crew of the 6-inch gun we had mounted aft to have it run out and ready when there was a chance to fire. We had a gunner from the Royal Marine Artillery on board. He was a crack shot, and was waiting keenly for a chance to hit one of the U-boats in return for one of their craft having left his brother to drown in the open sea after his ship had been sunk.

"In less time than it takes to spin this yarn," the officer continued, "the big U-boat passed under the counter aft and when she was about 100 yards astern, just sufficient distance to allow for the depression of the gun, the first shot was fired and struck her amidships. As the 100-pound shell from our gun exploded, the submarine's petrol tanks blew up, and a bright flame shot up fully 125 feet. We saw three or four of her crew try to climb out of the manhole on deck as the second shot was fired. This one blew the undersea craft to pieces.

"Beyond a quantity of oil and air bubbles which rose to the surface afterward, there was no trace of the U-boat left. She was nearly 300 feet long and fully 1500 gross tonnage, and had on the outside of her hull all kinds of gear for cutting through wire nets, throwing off mines, etc.

"The commander never had a chance to open up and fire his deck guns because the collision with our ship blinded and crippled his craft so severely that he had to come up and take a chance without knowing where he was going or what he was up against."

On the arrival of the ship at a port in England the captain made his report of the sinking to the Admiralty, where he was complimented by the officials. Upon his return to England he will receive the prize sum of $2000 awarded to the master of any merchantman who manages to destroy a submarine.—*N. Y. Times*, 19/8.

GERMANS AGREE TO SPARE HOSPITAL SHIPS.—Madrid, August 18.—The German Military Attaché has handed to the Spanish Government Emperor William's definite acceptance of conditions under which hospital ships are to be protected from attacks by submarines.

Seven Spanish officers have gone to France to act as commissioners on board the hospital ships. Under the arrangement a neutral commissioner will be carried on each hospital ship to guarantee that it transports only sick and wounded.

On at least one occasion, probably more, before the United States entered the war, Downing Street had asked this country to use her good offices at the Wilhelmstrasse in protest against sinking the regularly registered and internationally marked hospital ships in the service of the Allies.

Two alleged flagrant violations of international law had been charged against the German Navy in this respect: The sinking of the British hospital ship *Britannic*, with a loss of 50 lives, and the *Braemar Castle*, both in the Aegean on November 21 and 24, 1916, respectively.

It was unofficially declared in Berlin that the British and French were using hospital ships for other purposes than those allowed by law; the transportation of sick and wounded with doctors and nurses and hospital supplies. In a debate in the House of Commons in March this was positively denied by a member of the British Government.

Then, 10 days after the United States entered the war, on April 17, occurred the most flagrant case of all: The sinking without warning, by a German submarine in the English Channel, of the British hospital ships *Donegal* and *Lanfranc*, with the loss of 75 lives, including 16 wounded German soldiers.

Diplomacy on the subject was then diverted from Washington to Madrid, and the case of the *Donegal* and *Lanfranc* was taken up together with that of the *Dover Castle*, another British hospital ship, sunk in the Mediterranean on May 26.

Since then a triangular course of diplomatic conversations has been going on between London, Madrid and Berlin. The Spanish Ambassador

at London, Señor Alfredo Merry de Val, it is understood, has forwarded the British complaints to Madrid, where they have been transmitted to Señor Polo de Bernabé, the Spanish Ambassador at Berlin, for presentation to the German Government, not without delay, however, caused by Prince von Ratiboe und Corney, the Kaiser's representative at the Spanish Court. It is believed that the present arrangement is largely the outcome of the personal intervention of His Majesty, King Alfonso XIII.—*N. Y. Times,* 19/8.

"NAVAJO" ENGAGES U-BOAT.—Captain J. F. MacDougall, with 29 of his crew and 13 of the naval gunners, survivors of the American oil tanker *Navajo,* belonging to the Standard Oil Company, which was destroyed by fire off the Irish coast on August 1, arrived at an Atlantic port with the story of a fight with a submarine in July which lasted four hours, and was spread over two days through fog. The gunners firmly believe that they hit the submarine with the twentieth shot during the second encounter off the Irish coast, and saw the enemy war craft go down stern first.

Edward Schafer, third officer of the *Navajo,* said they sighted the submarine off the coast of Ireland eastbound, and after the exchange of a few shells at long range she disappeared.

"Next morning the same U-boat, judging by her size and guns," the third officer went on to say, "appeared on the starboard quarter about 8 o'clock and opened fire with her 4-inch bow gun. Before we could get the range a sailing vessel hove in sight some miles astern and the submarine went off at full speed after her. After a couple of hours we heard a muffled explosion and saw the ship go down leaving the crew in two lifeboats. Then the submarine returned to the *Navajo* and a duel was commenced. Both vessels were evenly matched, as each used 4-inch guns. When 10 shells had been fired a British hydroplane was seen approaching and the enemy craft submerged. A few minutes later a dense fog settled on the water.

"In the afternoon the fog lifted and the lookout man at the mainmast head sighted the periscope of our friend, the submarine, right astern, about 2 miles away. Her gunners started the duel again with a well-directed shot which struck the tanker near the rudder post on the port side above the water-line, but did not do any serious damage to the ship.

"The Germans fired 30 more shots and then one of our gunners got home a shell, which struck the enemy well below the conning-tower, and knocked the craft all to pieces. She went down stern first, just as the smoke of a British destroyer appeared on the horizon in answer to our call for assistance."

The officers of the destroyer examined the oily surface where the German craft had disappeared, and were satisfied, they told Captain MacDougall, that the U-boat had been sunk by the shell from the stern gun of the *Navajo.*

The tanker proceeded on her way to a French port, and had her stern plates repaired, and on her way back to America the fuel pipes exploded and set fire to the vessel, which was destroyed.—*N. Y. Times,* 25/8.

GERMAN SUBMARINE SUNK.—The destruction of a German submarine with all hands by a British submarine in the Atlantic Ocean was described by the captain of a British steamer which was torpedoed by the enemy submarine. The trader, which was attacked on a voyage from this country to a British port, returned here after being repaired abroad.

According to the captain of the trader, the commander of the German submarine attacked the British merchantman by firing his deck guns when the torpedo which struck her failed to send her to the bottom. The trader's crew, who had taken to the open boats, witnessed the arrival of the British submarine and its attack on the German U-boat, which was broken in two and sunk by a torpedo from the British undersea craft.

The steamship crew then boarded their vessel, pumped her out, and reached a British port.—*N. Y. Times,* 28/8.

DAMAGED U-BOAT AT CADIZ.—A German submarine, seriously damaged, has arrived at Cadiz convoyed by a Spanish torpedo-boat.

The submarine will be interned in La Carraca Harbor.—*N. Y. Times*, 11/9.

U-BOAT SUNK.—How a German submarine hid behind his schooner until it got within range to attack an American tank steamer and later was sunk by the tanker's gun crew was told by the captain of a sailing vessel. "When about 1500 miles from Gibraltar," he said, "the U-boat ordered him to stop. The submarine then kept behind the schooner until the approaching tank ship was within range. When it began the attack the naval guard returned the fire, the eighth shot striking the German boat and sinking it within sight of the schooner's crew. Both steamer and schooner escaped injury."—*Washington Star*, 11/9.

PACIFIC

U. S. SHIPS INTERNED IN CHINA.—Five U. S. gunboats which were used in river work in China have been interned at Shanghai because they failed to leave their ports within 24 hours after the declaration of war between the United States and Germany. The vessels interned were the *Monocacy*, built in America and launched in 1914, and the most modern ship of the five, and the *Palos, Samar, Quiros* and *Villalobos*, former Spanish ships, captured by Admiral Dewey at the battle of Manila Bay. The Chinese authorities, in interning the vessels, merely removed the breech blocks from the guns and sealed the wireless, so that in the event of China entering the war the United States gunboats could be put back into shape for service and released within a few hours.—*United Service Gazette*, 9/8.

(Ed.—The U. S. ships interned in China have been released, according to the press.)

MARE ISLAND EXPLOSION VICTIMS OF A PLOT.—The board found that the accident was due to "the deliberate act of some person or persons unknown," but was unable to form any opinion as to the exact method employed by those who were guilty of having destroyed the magazine. Such evidence, if any existed, is declared by the investigating board to have been destroyed in the explosion. Private detectives have been employed by the Navy Department and are at work with agents of the government in trying to run down the plotters.

The report is the result of an investigation by the Bureaus of Ordnance and Navigation and the Judge Advocate General of the Navy. All those branches of the service agreed there had been no "hampering instructions or restrictive directions of the method of investigation."

The Navy Department made public on August 25 the following telegram from Commander Mark St. C. Ellis, U. S. N., Inspector of Ordnance at Mare Island:

"The public statements that investigation was blocked by labor here are not true. Such imputations slander the brave and heroic labor men here who risked their lives to save this plant in successfully fighting the fire. The Board of Investigation was not hampered by the laboring men, but was assisted by every employé here whole-heartedly."

After the customary formality of opening a report and showing the volume of the complete document by stating that it contains the testimony of 179 witnesses and 27 exhibits, the synopsis signed by all the investigators says:

"A careful reading of the orders creating this board and the record of daily proceedings clearly indicate the absence of any hampering instructions or restrictive directions as to the method of investigation. The board's inquiry was conducted with the utmost latitude and thoroughness.

"The board found that the explosion occurred at 7.55 a. m., July 9, 1917, and was confined to building No. 40, known as the black powder magazine. This building was a modern structure, built especially for black powder stowage. There were no electric lines into the building, no telegraph or telephone wires, no windows or other openings, with the exception of the regulation magazine doors. Under the existing rules and regulations, access to this building was restricted to comparatively authorized persons.

"The only person seen to enter this building on the morning of the explosion was Ordnance Man Neil C. Damstedt, a trusted employé of 21 years' continuous magazine service. Damstedt, according to the testimony, unlocked and opened the magazine door about 30 seconds previous to the explosion, and was probably in the act of entering the building when the explosion occurred. Damstedt was killed.

"The board in its findings states that it is of the opinion that Damstedt was in no way implicated in the explosion, and that the testimony and attending circumstances do not in any way implicate any ammunition depot employé or any member of the ammunition depot guard.

"Further, the board states that after having carefully considered all testimony and attending circumstances it is of the unanimous opinion that the explosion was not an accident, but was due to the deliberate act of some person or persons unknown. The board, however, was unable to form an opinion as to the exact method employed by the party or parties guilty of having destroyed this magazine, such evidence, if any existed, was destroyed in the explosion.

"The department and its experts are engaged in a thorough review and analysis of all available evidence in this case.

"Every effort is being made to apprehend the guilty parties and definitely ascertain the actual manner in which this destructive explosion was accomplished.

"For obvious reasons, the details of procedure cannot be made public." —*N. Y. Times*, 26/8.

NORTH SEA AND CHANNEL

DUTCH SOLDIERS SHOOT DOWN GERMAN AIRPLANE.—Two German airplanes, each carrying three men, landed near Winschoten late on August 18. One was in flames and the other was shot down by Dutch soldiers.

The occupants of the airplanes were uninjured.—*N. Y. Times*, 19/8.

GERMAN AIR RAID, AUGUST 22.—In an aerial attack, August 22, on the British coast military establishments at Margate, Ramsgate and Dover were bombarded successfully, the War Office announces. In numerous aerial engagements the Germans shot down three airplanes. Two German machines have not returned.

Official announcement was made in London, August 23, that 10 German airplanes had dropped bombs on Dover, Margate and Ramsgate. Eleven persons were killed and 13 were injured.—*N. Y. Times*, 24/8.

German Report.—A statement issued in Berlin in regard to the attack by airships on the northern coast of England says bombs were dropped with good effect on British naval forces. The statement supplements the official report on the raid, in which the loss of one airship off the coast of Jutland is admitted. It says:

"On approaching England, bombs were dropped in large numbers on outpost vessels. At 2 a. m. bombs were dropped on Hull, causing fires. The airships also dropped bombs with good effect on Lincoln and on the southern bank of the Humber, near and east of Grimsby, above brightly illuminated factories. Extinction of lights showed that buildings had been hit. On their return the airships dropped bombs with good effect on naval forces."

London, August 24.—The Admiralty states that no British ships were hit by bombs dropped in the Zeppelin raid.

Zeppelin Destroyed.—The British Admiralty announced on August 21 that a Zeppelin had been destroyed off the Jutland coast. The official account of the Zeppelin raid said bombs were dropped on small villages near the Yorkshire coast.—*N. Y. Times*, 25/8.

GERMAN TRAWLERS DESTROYED.—The demoralized remnants of the German armed trawler fleet that was attacked and shattered by a British destroyer force September 1 off the Jutland coast in the North Sea, four of the German craft being driven ashore and destroyed, made off to the southward, scattering and sending wireless messages for assistance as they ran. A detachment of German light naval forces, accompanied by hydroplanes and submarines, arrived soon afterward, but too late to save the four trawlers that had been run ashore. In the course of the encounter that ensued a German hydroplane was brought down and a companion craft was seen to dive to the water, presumably to rescue the survivors.

The German armed trawler fleet, confident in its protection by Zeppelin observation and the proximity of a supporting squadron, has of late worked in the boldest fashion in sweeping the seas clear on the route for submarines, and has been extending its sphere of operations northward. Frequent reports from the Danish coast towns have mentioned the sighting of warships, and the daily Zeppelin patrol was one of the sights of the big Danish resort of Fanoe. The experience of September 1 seems likely to make the Germans more cautious, and to that extent interfere with the submarine campaign.—*N. Y. Times*, 3/9.

TRAWLERS CLEARED PATH FOR U-BOATS.—An Exchange Telegraph dispatch from Copenhagen gives the story of German sailors who escaped from the armed trawlers run ashore on the Jutland coast near Ringkjobing and destroyed by British vessels.

The Germans say that four trawlers left early August 31, in pairs, with great steel nets between them, for catching British mines. Two submarines accompanied them.

The sailors assert that they made several trips successfully, enabling the submarines to pass through the British mine field.

While the German sailors were standing on the Danish shore after their rescue, a German warship appeared and signalled orders to the sailors to embark in Danish fish boats and proceed to the warship. They refused, and the commander of the warship sent a motor boat to fetch them. This boat capsized. Its crew was saved by fishermen.—*N. Y. Herald*, 6/9.

GERMAN AIR RAID, SEPTEMBER 2 AND 3.—A German aerial raid on the coast of England, during the night of September 2-3, was announced by the official bureau.

Bombs were dropped as the aeroplanes crossed East Kent.—*N. Y. Herald*, 3/9.

German aeroplanes flew over the southeast coast of England during the night of September 3-4, dropping bombs at various places, according to an official statement issued after midnight. No report of casualties or damage has been received up to the present time. The official statement follows:

"Enemy aeroplanes crossed the southeast coast at 11 o'clock last night and dropped bombs at various places. No reports of casualties or damage have yet been received.

"A number of our aeroplanes pursued the enemy."

One person was killed and six were injured by bombs dropped in the aerial raid over East Kent on night of September 2-3, it is announced officially. The attack was made by a single aeroplane and was directed against the important Channel port of Dover. The official announcement issued September 2 follows:

"Last night's raid was carried out by one enemy aeroplane, which bombed Dover shortly after 11 o'clock. Seven bombs were dropped. One man was killed and four women and two children were slightly injured."—*N. Y. Herald*, 4/9.

In last night's (September 3-4) air raid 107 persons were killed and 86 wounded at Chatham, it is announced officially. The victims were naval ratings. Six aeroplanes took part in the raid. A dispatch to the *Star* from Chatham says that part of the naval barracks there was struck by a bomb during last night's raid, this causing the serious loss of life. The Chatham dockyard, the message states, entirely escaped damage.

In additoin to the naval casualties one civilian was killed and six were injured. The announcement follows:

"Lord French (commander of the British home forces) reports that last night's air raid was carried out by about six enemy airplanes, which proceeded up the south bank of the Thames estuary to Chatham. Bombs were dropped on the Isle of Thanet and in the Sheerness-Chatham area between 10.40 p. m. and 11.40 p. m. There were no army casualites. Civilian casualties reported at present are one killed and six injured. The material damage was slight.

"Our machines went up and anti-aircraft guns came into action, but without result. The Secretary of the Admiralty reports that in the course of the air raid last night the following casualties were caused to naval ratings: Killed, 107; wounded, 86."

Dispatches from towns on the southeast coast say many inhabitants believed last night's raiders were Zeppelins, as they made much more noise than usual for airplanes. There was heavy firing, first at one point and then another, and finally heavy explosions occurred.

Shortly before 9 o'clock explosions and heavy firing could be heard in the direction of Dunkirk and Calais, and it was thought a raid on a large scale was taking place along the French coast. This lasted until nearly midnight, when warnings were given and shortly afterwards bombs began to drop. Anti-aircraft guns went into action, and the whir of airplane engines could be heard. Searchlights were brought into operation, but failed to pick out the raiders.

Chatham is on the east bank of the Medway, 30 miles southeast of London. It is the seat of immense military and naval establishments, including a vast dockyard, an arsenal, and extensive barracks.—*Washington Post*, 5/9.

DUNKIRK AND CALAIS RAIDED SEPTEMBER 3-4.—The French official statement issued September 4 contains the following:

"The vicinity of Calais and Dunkirk was visited last night by German aviators, who threw down bombs. Calais reports that several persons were either killed or wounded. In the environs of Luneville and in the country to the north of Nancy there were also visits from enemy airplanes. The material damage was insignificant and no one was hurt.

"French bombing airplanes covered with their projectiles the aviation field and various barracks and railroad stations in the enemy zone to the north of Soissons.

"Another French air expedition was successful in starting two fires in the railroad station in the Noye-le-Grande. Furthermore, French machines bombed the railroad stations at Roulers and Lichtervelde, in Belgium; aviation fields at Colmar, Frescati and Habseim and the railroad stations at Conflans, Cambrai, Thaionville, Metz and Waippy, where a violent outbreak of flames was observed. During these various expeditions 15,000 kilos (33,000 pounds) of projectiles were thrown down by our squadrons upon locations of the enemy, which suffered heavy damages.

"During the day of September 3, French pursuit airplanes brought down 13 German machines, most of which were completely destroyed."—*Washington Post*, 5/9.

BRITISH ATTACK BRUGES.—Continuing their raids over Belgium, British aviators September 2 made attacks in the vicinity of Bruges. A British

airplane fought six Germans and shot down one of them. The following official account of these operations was given out September 4:

"Naval aircraft made a bombing raid at midnight Sunday (September 1) in the docks, submarine shelters and railway siding at Bruges. Bombs were observed to explode over the objectives and fire was caused adjacent to the lock gates of the Ecluse Canal.

"A raid also was made early September 3 on the airdrome at Varssenaere (4½ miles southwest of Bruges). Bombs were seen to explode among the sheds. One of our machines was attacked by six hostile aircraft and succeeded in shooting down one, completely out of control. In an engagement between one of our aircraft patrols and enemy machines there were three decisive combats. One of our machines failed to return."—*Washington Post*, 5/9.

GERMAN RAID SEPTEMBER 4-5.—Another air raid on England has taken place. The English coast was shelled, as well as the London district. The official report of the raid says:

"A considerable number of enemy airplanes crossed the southwest coast at 11 o'clock (night September 4-5) and dropped bombs at a number of places. Some of the machines reached the London district, where bombs were dropped."—*Washington Post*, 5/9.

U-BOAT SHELLS SCARBOROUGH.—During the prevalence of a thick mist a German submarine appeared about 2 miles off shore at 7 o'clock last evening (September 4) and began to bombard the town. About a dozen shells were fired in quick succession, the shore at the time being crowded.

British mine sweepers began an attack on the submarine and the cannonade became deafening. The submarine soon submerged and was not seen again.

The material damage inland was small, considering the fact that the bombardment lasted 10 minutes. A station 2 miles inland was hit by a shell, but no one was injured.

Some persons assert that they saw two submarines, but the presence of more than one undersea boat has not been confirmed.—*N. Y. Herald*, 6/9.

ESCAPING GERMAN PRISONERS CAPTURED.—The recapture at sea of six escaped Germans is announced by the Admiralty. The statement follows:

"British light forces, while patrolling the North Sea on September 1, captured a small boat containing six German prisoners, who had escaped from this country."—*N. Y. Herald*, 6/9.

BRITISH RAID BRUGES SEPTEMBER 3 AND 4.—Tons and tons of bombs have been dropped in further raids on German military establishments in Belgium, causing large fires. The Admiralty to-day gave out the following account of these operations:

"At midnight on the 3d inst. a bombing raid was carried out by naval aircraft on the Bruges docks, the Varssenaere airdrome and the Ghistelles airdrome. Many tons of bombs were dropped with good results.

"A second raid on the Bruges docks was made at noon on September 4. Direct hits were observed on special targets. Many sheds along the quay were hit, and large fires which were caused were still seen to be burning when the machines recrossed the line. All our machines returned from both raids.

"On Monday afternoon, the 3d inst., an enemy aircraft spotting machine was engaged by one of our fighter patrols and shot down, completely out of control. An enemy kite balloon also was attacked and the observer was forced to jump out. Owing to the anti-craft fire the fate of the kite balloon was not observed."—*N. Y. Herald*, 6/9.

HOLLAND TO BAR U-BOATS IN SCHELDT.—The Dutch Foreign Ministry denies categorically reports that Holland is being pressed by Germany

for permission for submarines to use the river Scheldt. The Ministry adds that Holland under no consideration will allow the Scheldt to be used for naval purposes by any belligerent.—*N. Y. Herald,* 8/9.

MINES MENACE NORWAY.—Thousands of drifting mines have been observed along the west coasts of Norway and Denmark, says an Exchange Telegraph dispatch from Copenhagen September 9.

Six children were killed on Saturday by a mine which drifted on a beach along the Jutland shore.—*N. Y. Times,* 9/9.

BALTIC

GERMAN ACTIVITIES.—That the German fleet is preparing to make another effort to force its way into the Gulf of Riga appears evident from the fact that enemy mine sweepers have been operating at the mouth of the gulf, and that torpedo-boats and U-boats have been sighted along the coast in the vicinity. Forty airplanes have raided islands in the gulf and dropped 90 bombs on ships of the fleet and harbor works. Russian airmen engaged the hostile machines. The communication follows:

On the Baltic Sea for the past week the enemy has shown increased activity. About 40 enemy bomb carriers and battleplanes have carried out a series of raids on various islands in the Gulf of Riga and at the entrance to the Gulf of Finland, dropping about 90 bombs on ships of the fleet and on harbor works. Our naval airmen had a series of engagements with the enemy in the course of which we suffered no loss or damage.

The appearance of enemy ships—torpedo-boats and submarines—in the vicinity of our coast, and the operations of enemy trawlers at the entrance to the Gulf of Riga, have been observed.—*N. Y. Times,* 1/9.

German Fleet at Gulf of Finland.—It is reported from Helsingfors, Finland, that a German fleet has been observed at the entrance to the Gulf of Finland, says a dispatch to the Exchange Telegraph Company from Copenhagen. It is supposed, adds the dispatch, that the fleet is preparing for an attack on Reval and Kronstadt, the Russian naval bases.—*N. Y. Herald,* 7/9.

Despite reports to the contrary, no enemy vessels other than submarines have been observed in the Gulf of Riga, the Russian War Office announces, and all steamships and floating defences that were in the port of Riga were convoyed to safety. Moreover, the naval forces on guard are ready to engage the enemy.

On the Baltic Sea, between August 29 and September 5, the enemy has concentrated his operations in the region of the Gulf of Riga. Enemy Zeppelins appeared south of Pernau. Bombs were dropped by them near Hainash, but were without effect.

Enemy submarines appeared in the Gulf of Riga September 3 and shelled by night three points on the coast between Riga and Pernau. Forty rounds were fired, and in the village of Kabdoki one woman and one little girl were killed and one woman was wounded. By day an enemy submarine attacked the transport *Linol,* at which about 20 rounds were fired. The transport, which had only 37-millimeter guns, engaged the submarine, forcing it to submerge and retire. Two men on the transport were wounded.

Our gunboats and torpedo-boats remained at the mouth of the Dvina (at Riga) until the last moment, and on leaving convoyed steamships and floating defences from the port of Riga. Other enemy vessels, aside from submarines, were not observed in the Gulf of Riga, where our naval forces are on guard and ready to engage the enemy.—*N. Y. Times,* 8/9.

MEDITERRANEAN

TURKS REFUSE TO HAVE PRUSSIAN ADMIRAL.—A Reuter dispatch from Berlin via Amsterdam says that Admiral Souchon, commander-in-chief of the Mediterranean division, who during the war has also commanded the

Turkish naval forces in the Mediterranean, has been recalled and will be entrusted with other duties.

According to an Exchange Telegraph dispatch from Amsterdam, Admiral Souchon's recall was due to Turkish officers objecting to being commanded by an alien officer. The recent trip of Talaat Bey and other Turkish officials to Germany was to obtain the recall of the admiral and the reorganization of the Turkish fleet under Turkish officers.—*N. Y. Herald*, 6/9.

ITALIAN MERCHANT CRUISER SUNK.—News of the sinking of the Italian warship *Umberto I*, by striking a mine, while convoying merchant vessels through the Mediterranean Sea, was brought to an Atlantic port by a Norwegian steamship to-day. Fifty of the crew perished, according to the story told here. The *Umberto I* was a converted merchantman.—*N. Y. Herald*, 11/9.

ADRIATIC

ALLIED MONITORS SHELLING DEFENCES AROUND TRIESTE.—For five days Italian and British monitors have shelled the defences of Trieste incessantly, according to cables received by high Italian officials in Washington.

The monitors dominate the entire Gulf of Trieste. They are protected by a screen of torpedo and motor boats.—*Washington Post*, 31/8.

AUSTRIAN SUBMARINE SUNK.—An Italian official statement of September 10, 1917, announces the sinking at Pola on September 9, by Italian airplanes, of one Austrian submarine and one cargo boat loaded with food and munitions.—*Army and Navy Journal*, 15/9.

MONITORS BOMBARD POLA.—Pola, Austria's greatest naval base, where since the beginning of the war the dual monarchy's main fleet has been bottled up, is being shelled by the great new Italian monitors and their consort British monitors that, protected from submarine attacks by a large fleet of destroyers, motor boats and mine sweepers, have been operating in the Gulf of Trieste.

Unofficial advices received at the Italian Embassy indicate that the attacking warships have advanced down the coast to within eight miles of the stronghold, where it is believed the Austrian general staff has had to keep several hundred thousand troops for its protection, because of its investment from the sea.—*N. Y. Times*, 4/9.

ITALIAN AIR RAID ON POLA.—Thirtv Italian airplanes have dropped nine tons of bombs on the fleet at anchor and on military works at the Austrian naval base of Pola, causing destruction and large conflagrations, it is announced officially. All the machines returned safely. The statement reads:

"Last night, September 2-3, under favorable atmospheric conditions, 30 of our airplanes flew over Pola and bombarded the military works of this naval port and the enemy fleet at anchor in the harbor and in the Fasana Canal. Nine tons of bombs were dropped on the targets, causing destruction and great conflagrations. Our machines, although attacked by seaplanes and shelled by anti-aircraft batteries, returned safely to their bases."—*N. Y. Times*, 5/9.

ITALIAN MONITORS OUT-RANGE AUSTRIAN DREADNOUGHTS.—An official Italian dispatch received in Washington from Rome August 26, in addition to containing a vivid description of a joint Italian and British naval bombardment of the Hermada, the mountain pass barring the way to Trieste, and a marvelous Italian infantry advance up fortified terraces of this defensive position, tells of the employment of an Italian device used for the first time in this battle. Its results are disclosed, but a description of the

device is withheld. It is believed to be a combination of enormous floats carrying heavier guns than any used in naval warfare and reputed to be the largest ever known, and a new type of shell.

According to the official account, this new instrument of warfare is being employed in dropping shells on the city of Trieste, the principal Austrian port. Its fire is sweeping the Hermada in co-operation with the guns of British monitors. The dispatch indicates that Trieste is the main objective of the Italian offensive, which appears to be on the point of success.

Following is that portion of the official dispatch from Rome that is made public:

"The bombardment of the Austrian positions was accomplished in the Gulf of Trieste by two English monitors and three great Italian monitors, which shelled and struck the most vital points of the Austrian defences with guns of such large caliber and long range as the Austrians never before experienced. The Italian Navy has surpassed in caliber and range every previous record by mounting on special floats, whose construction and detail are a profound secret, artillery of a power exceeding any armament on any Austrian dreadnought.

"The Italian Navy has devised and inaugurated a new system of naval warfare. This element of surprise was a part of the new enterprise in the Gulf of Trieste. While the artillery fire was in progress over the Carso, the Italian and English monitors, escorted by torpedo-boats, motor boats, submarines and airplanes, proceeded to the Gulf of Trieste, crossing mine fields, and at 3 p. m. the English monitors opened fire against Hermada's slopes on the side opposite the Italian front, where the Austrian reserves and artillery had been concentrated.

"The Italian 305's were making hundreds of craters upon the sides and upon the high plateaus of the Hermada, while the Italian monitors maintained a still more terrific fire against the Austrian military buildings and depots in the city of Trieste. A large number of Italian airplanes were constantly in the air over the naval forces, expecting Austrian aerial craft to come out to drop bombs upon the ships, but the Austrian flyers did not venture forth. The Austrian coastal batteries opened fire, but the English monitors were not hit, they refraining to answer the coastal batteries' bombardment, but directing all their fire against the Hermada, stopping only when the Italian infantry launched their attack against the Hermada.

"At night the English monitors returned, without having been damaged. The Italian monitors also stopped firing at night. During the bombardment smoke was observed near Pola, it being learned that it issued from the Austrian battleships, which had steamed up, but did not dare risk coming out.

"The Austrian command, discovering that the top of the Hermada was being dominated by the Italian artillery due to the intervention of the new Italian monitors, ordered the Austrian aviators to destroy the Italian monitors during the night. The enemy aircraft came out, but were compelled by the anti-aircraft guns to withdraw, after dropping a great many bombs without result, one Austrian airplane, remaining longer than the others, being shot down and its occupants perishing.

"Trieste is still under fire of the Italian naval guns, and the Italian successes are causing the Austrian command great unrest.

"The Hermada is a mountain not of very high altitude, but extended and rocky, and is isolated between the Carso and the sea. It is the strongest fortress barring the way of the Italians to Trieste. On its slopes are innumerable deep grottoes which are able to accommodate and shelter the heaviest artillery. Guns of every caliber are spread over every side of the mountain. On the slopes of the mountain are fortified terraces, like great stairs, stretching from the base to the summit. An enormous number of machine guns protect the base of this fortress.

"The Hermada was attacked by the Italians from three sides simultaneously, from the front and the north by Italian artillery, and from the

sea by the batteries of the Italian and English monitors. Airplanes at the same time were dropping bombs upon the Austrian works from the sky. During the artillery attack the mountain seemed like a volcano. The rock, concrete, and great barbed wire systems were seen to be giving away. The scene was one of terrible grandeur and lasted all night.

"It seems the Italian command, knowing a free Europe must issue from the victory of the Allies, is competing in bravery and action, bringing Italy's maximum contribution to the common effort of crushing the Central Empires.

"The genius of General Cadorna, which ripened in silence, has heretofore been chiefly observed in his organization of the closest collaboration between the different arms over a very large front, obtaining the largest results possible from the co-operation of the aerial and naval arms."—*N. Y. Times*, 27/8.

U. S. ARMY

NEW ORGANIZATION FOR U. S. ARMY.—The complete plan of reorganization of the army—regulars, national guard and national army—is disclosed in army general orders made public August 15, prescribing the formation for all tactical units from division to armies. The composition of each division on the European standard is prescribed and provision made for the organization of all additional troops into training battalions of 612 enlisted men each, to be used in any way found necessary.

The orders show also that designation of divisions by number begins with the regular army division now in France and which has already been reorganized on the basis of 19,000 men and additional battalions of attached troops. That is the 1st Division, United States Army. All other regular divisions, up to and including the 25th Division will be numbered in order. That does not mean that 25 regular divisions are to be created immediately, but that the numbers from 1 to 25, inclusive, have been reserved for the regular divisions.

National guard divisional designations will go from the 26th Division to the 75th Division, inclusive, and national army divisions from the 76th Division up. To-day's order provides the organization of 16 national army divisions, designated from the 76th to the 91st, inclusive, and succeeding divisions will be numbered in order after these.

All the divisions provided for will be infantry divisions, composed of division headquarters detachment, one machine gun battalion of four companies, two infantry brigades of two regiments and a machine-gun battalion of three companies each; one field artillery brigade of three regiments and a trench mortar battery each; one engineer regiment; one field signal battalion; one headquarters train and military police; one ammunition train; one engineer train, without pontoon and searchlight sections; one supply train and one sanitary train of four field hospitals and four ambulance companies.

Each army corps will consist of an army corps headquarters force and three infantry divisions, supplemented by necessary attached troops to be designated as army corps troops. Each army will consist of an army headquarters, three or more army corps and such additional army troops as may be advisable.

The order directs that the national guard proceed to its training camps under its present divisional organization. It will be completely reorganized at the camps, however, on the new divisional basis and the excess troops formed into training battalions, with a brigadier general in command of the group of training battalions at each camp.

The 26th Infantry Division will be created out of the old 5th Division, National Guard, and be located at Camp Greene, Charlotte, N. C.; the 27th out of the old 6th, Camp Wadsworth, Spartanburg, S. C.; the 28th out of the old 7th, Camp Hancock, Augusta, Ga.; 29th out of the old 8th, Camp McClellan, Anniston, Ala.; 30th out of the old 9th, Camp Sevier, Green-

ville, S. C.; 31st, old 10th, Camp Wheeler, Macon, Ga.; 32d, old 11th, Camp MacArthur, Waco, Texas; 33d, old 12th, Camp Logan, Houston, Texas; 34th, old 13th, Camp Cody, Deming, N. M.; 35th, old 14th, Camp Doniphan, Fort Sill, Okla.; 36th, old 15th, Camp Bowie, Forth Worth, Texas; 37th, old 16th, Camp Sheridan, Montgomery, Ala.; 38th, old 17th, Camp Shelby, Hattiesburg, Miss.; 39th, old 18th, Camp Beauregard, Alexandria, La.; 40th, old 19th, Camp Kearny, Linda Vista, Cal.; 41st, old 20th, Camp Fremont, Palo Alto, Cal. In addition, the 42d Division, the composite national guard division, is being mobilized at Camp Albert H. Mills, Mineola, L. I.

The 76th Division, National Army, will be at Camp Devens, Ayer, Mass.; the 77th at Camp Upton, Yaphank, L. I.; the 78th at Camp Dix, Wrightstown, N. J.; the 79th at Camp Meade, Annapolis Junction, Md.; the 80th at Camp Lee, Petersburg, Va.; the 81st at Camp Jackson, Columbia, S. C.; the 82d at Camp Gordon, Atlanta, Ga.; the 83d at Camp Sherman, Chillicothe, Mo.; the 88th at Camp Dodge, Des Moines, Iowa; the 89th at Camp Funston, Fort Riley, Kans.; the 90th at Camp Travis, Fort Sam Houston, Texas, and the 91st at Camp Lewis, American Lake, Washington.

The new practice of numerical designation for brigades is carried out, the 151st and 152d infantry brigades and the 151st artillery brigade going into the 76th Infantry Division, National Army. The 151st infantry brigade will be composed of the 301st and 302d infantry regiments, and as this is the first of the national army division, all unit designations below the brigade also will begin with 301. Brigades, regiments, trains and machine-gun units in other divisions will be numbered in order, putting the 181st and 182d infantry brigades and the 361st to the 364th infantry regiments, inclusive, into the 91st Infantry Division at American Lake, Wash.

Under that system infantry regiments from the 300th down to the 101st will be national guard, and below that regulars.

The result of the system will be to identify any organization by its number alone as regular, national guard or national army, and do away with any necessity of referring to it except by number.—*N. Y. Times,* 16/8.

DRAFTING YOUTHS OF 19 TO 21 PROPOSED.—In a signed statement given out August 28, Lieut. General S. B. M. Young, U. S. A., commander-in-chief of the Military Order of the Loyal Legion of the United States, and president of the National Association for Universal Military Training, advocated the early drafting of youths between 19 and 21 years, to form the national army.

General Young says that of the 9,600,000 men registered, fully 80 per cent of the married men have not hesitated to walk up and claim exemption on that ground alone, which means that only a small percentage of the married men in the nation are willing to bear arms in defence of it. This is a condition which was not only surprising, but which is full of menace, and to which there can be but one answer—the young, unmarried men must save this country even as they saved it in the Civil War.

After quoting statistics to show that the bulk of the Union army was composed of youths under 21, General Young analyzes the results of the present draft and concludes:

"After the first and second drafts are made there will be approximately 626,000 men available for purely military service who will not have been included in the first two drafts. Now, since the first and second drafts will total about 1,374,000, and experience shows that three men are required in reserve for each man on the firing line, the 626,000 left over from the first registration will not be adequate for even a reserve force for the men actually on the firing line, but will fall short of the number which experience has proved necessary by some 3,496,000.

"By using the comprehensive machinery set up by the War Department for carrying out the provisions of the Draft Law, and which is still in existence and in perfect working order, the remedy which I have to propose can be immediately realized. This remedy is embodied in the following amendment to the draft law:

"'All male persons resident in the United States who are 19 years of age and not more than 31 years of age on the (date when this amendment shall go into effect), and who were not registered in pursuance of the Act of May 18, 1917, shall be registered at such time and place as the President may by proclamation direct.'

"It should also be provided that none of the men affected by the law so amended should be called for active military service before reaching the age of 21 years.

"Granting that the proposed amendment shall be adopted by Congress, the same to go into effect June 5, 1918, a startling and illuminating comparison with the figures of the recent registration and draft given above is immediately presented: On June 5, 1918, there would be three classes—males 19, 20 and 21 years of age—affected by this proposed amendment. These three classes would total 3,000,000 men, and after rejections would net approximately 1,920,000 men fit for training for military service. In these three classes there will be a much smaller average percentage of exemption than in the older classes which were comprehended in the recent registration.

"In round numbers, 1,000,000 men arrive at the age for military service each year. Allowing for proper deductions on account of physical and mental unfitness and for the exclusion of only sons of widowed mothers, we would have as a result about 640,000 men fit for training for purely military service, and these men could be called into the cantonments for training as rapidly as these cantonments were evacuated by the final increments of the new national army, which were produced by the drafts under the registration of June 5, 1917.

"By utilizing these splendid camps as permanent training quarters for our young men from 19 to 21 years of age, we would not only conserve our young manhood but would profit by the immense equipment provided at such an enormous initial outlay. It is our plain duty to so use these camps and thus fit our youth to become real defenders of the nation. It is the rational, the obvious thing to do.

"Of course, the logic of the foregoing points with unerring accuracy to universal military training as the fundamental principle of a permanent, continuing military policy. The Draft Law is the first great stride toward this goal, and the amendment above suggested, when realized, will form the second. The third and final step will have been taken when the principles of the Draft Law as amended along the lines suggested shall have been made the permanent military policy of the United States."—*N. Y. Times*, 27/8.

CUBAN CAMP ACCEPTED.—Cuba's offer to provide a mobilization and training ground for some American forces has been accepted. The number or description of the forces to be sent cannot be disclosed for military reasons. The State Department issued this statement:

"The government of Cuba has offered in a most friendly spirit to the government of the United States the use of training grounds in that Republic for American forces.

"This generous offer has been accepted by this government with great pleasure and careful consideration has been given to the question as to which of the American forces would be most benefited by training on the island of Cuba.

"This question has now been determined and American forces will proceed to the eastern end of Cuba for training at an early date.

"The action on the part of President Menocal in making this friendly offer is considered as a further proof of Cuba's desire to give cordial co-operation to the United States of America and to be of every assistance to it in the war which both countries are now waging for the rights of humanity against the Imperial German Government."—*Army and Navy Register*, 25/8.

WILL TRAIN NEGRO SOLDIERS SEPARATELY.—Announcement was made September 10 by the War Department that the practice observed in the regular army of training negro troops separately will be followed in regard to the national army.

The call for negroes who are subject to service in the national army will not be made immediately, and while they will not be the last to be called, they will not be mobilized in the near future.

The same general program will be followed in regard to the points at which negro volunteers and those subject to service under the Selective Draft Law as that followed as to other troops, namely, where they are residents of states in which there are cantonments they will be trained at such cantonments.—*N. Y. Herald*, 11/9.

GENERAL

LETTER FROM NAVAL OFFICER.—The following letter describing the war at sea and the part the United States must play in it, is from a lieutenant in the navy, now on one of the United States destroyers under Admiral Sims' orders off the Irish coast. It was received recently by a brother of the naval officer, who is a resident of Washington, says the *Washington Post*.

It has such a lesson in it for well meaning, but misguided pacifists, who are seeking in every way to block Uncle Sam's war making, that it is worthy of reproducing. It follows:

"Believe me, I appreciate being in port once more after the little cruise we had during the last week. It was mighty rough and our duty required us to buck the sea at high speed, which didn't add to our comfort at all, at all.

"I suppose I should be duly grateful that I'm not seasick, but at the same time I am rather fond of sleeping, as you well know, and that was not an easy stunt to do last week. I guess we are just getting acquainted with a little of the duty we had ahead of us for this week and many weeks thereafter.

"Really, I hope you won't take this as meaning that I am sick of the job. It is the most thrilling work I've ever had—this game of hide and seek we play with Fritz—and I have not found it at all monotonous, so far, at least. I think all of us feel the same about this war. We'd be mighty glad if it were over right now, but not unless it were finished once and for all time.

"We have no desire for a peace that is merely the *status quo ante*, for we all know that means only that Germany will strike again when she is ready.

"I didn't hate Fritz at the beginning of this war, but no matter how hard you try you can't keep his ever recurring brutality from affecting you and gradually you come to the opinion that he must be soundly whipped before we can once more have peace on earth, good will toward men. And I am mighty proud of that country of ours.

"Jim, patriotism has really been a sort of empty word to me until lately, I must confess. This 'my country, right or wrong' business has not sounded just right to me. I know I would have fought just the same even if I had owned a secret hunch that we were in the wrong, but there couldn't have been the same joy in my heart that there is when I know that we are really a free people fighting for what we know is right, and without any chance for material gain, even if we are absolutely victorious.

"It's good to know that no one can insinuate that you are really fighting for something far different from your professed aims.

"And I think that country of ours is going to come through with a punch that will count, too, Jim. She's moving slowly because she has been asleep a long time and she's bound to make mistakes as she goes along, but I am beginning to feel a confidence in our coming through all right and not blundering any more than the other nations have done—probably not so much.

"If this chances to reach you while Congress is holding up some matter of vital national importance while they discuss whether Joe Gish's swamp shall be drained at government expense, you will be plumb disgusted with me, I know.

"I think the reason I am an optimist is that I know I am doing useful work over here, that we all are.

"We haven't conquered Fritz yet—not by a long shot—but we are hampering him to beat the band, I think, and I know we are saving a lot of poor sailormen from the spectacle of seeing a madman gloat over them as they go down for the third time.

"If Fritz should chance to get us—which we are not planning on his doing—still I say I'm glad we are here, and I am glad the money the people of the United States have spent on me has not been entirely wasted so far.

"This letter does not sound like a letter a fond husband ought to write, does it? I would give anything to have my wife here with me (I don't mean here in the war zone literally), but I hope you don't think it's mere theatrics when I say I don't want to go home; there's too much work to do, and too few of us with the advantages of the training necessary to enable us to do it.

"I have a great deal of work ahead of me, and as we sail soon I must get busy. Good-bye, old top. Affectionately, your brother."—*Army and Navy Register,* 25/8.

AN INCIDENT IN THE OFFICIAL REPORT.—The Royal Naval Air Service found itself "over the other side" about the time that the shells of the British monitors began feeling for the hidden batteries of the "Boche" behind the Belgian coast.

"I can't see where they're pitching," said the navy-that-floats, referring to the shells of the monitors bursting 12 miles away. "What about spotting for us, old son?"

"That will I do," replied the navy-that-flies, "and more also. But I shall have to wear khaki, because it's done out here by everybody apparently. Even the newspaper reporters wear khaki. Also I must have the right machines and lots of 'em."

"Wear anything you like," replied the navy-that-floats, "as long as you help us to hit these shore batteries. Only because you wear khaki and see life, don't forget you're still the same old navy as it was in the beginning, is now and ever shall be."

The navy-that-flies added "Amen!" and said that it wouldn't forget. It garbed itself in khaki, but retained the ring and curl on the sleeve and the naval cap (with the eagle's wings in place of the crown and anchor in the badge), plus a khaki cap cover. Wherever its squadrons were based they rigged a flagstaff and flew the white ensign at the peak. They erected wooden huts and painted them service gray, labelling them "mess deck," "wardroom," "gunroom," etc., as the case might be.

They divided the flights into port and starboard watches and solemnly asked leave to "go ashore" for recreation. Those who strayed from the same stern paths of discipline suffered the same punishments as the navy-that-floats. And at the conclusion of each day's work the wardroom dined and drank to their King, sitting, according to the custom and tradition of the naval service.

They filled in shell holes and levelled the ground for aerodromes; they ran up hangers and excavated dugouts, whither they retired in a strong, silent rush—the expression is theirs—when the apprehensive Boche attempted to curtail their activity with bombs.

And by degrees the right machines came along. The navy-that-flies swung itself into them critically, flung them about in the air 3 miles high, testing and measuring their capabilities. Then they fought them, crashed

them, improved on them until they were righter still and finally proceeded—to quote another of their expressions—to "put the wind up Old Man Boche" in the way that helped the navy-that-floats enormously.

But apart from spotting duties, which were necessarily intermittent, the R. N. A. S. undertook a photographic reconnaissance of the entire Belgian coast from Nieuport to the Dutch frontier. The work in progress at Ostend and Zeebrugge, the activities of submarines and destroyers inside the basins, locks, quays and gun emplacements and the results of bombs dropped thereon the night before were all faithfully recorded by these aerial cameras. The negatives were developed and printed, the resultant birdseye pictures enlarged, studied through stereoscopic lenses and finally given to the monitors "for information and guidance." Since it is not given to everyone to recognize the entrace to a dugout or a group of searchlights as they appear from a height of 20,000 feet, the photographs were embellished with explanatory notes for the benefit of any one unaccustomed to such unfamiliar aspects of creation.

The Germans say they are a modest people. They were as busy as beavers, and they resented these importunate photographers with all the fervor that springs from true modesty. Their anti-aircraft guns plastered the intruders with bursting shrapnel, and from every coast aerodrome Boche machines rose like a cloud of angry hornets to give battle. Yet day after day fresh plates find their way to the developing trays, and a comparison between the official reports of the flight, couched in a laconic terseness of phrase that is good to read, and the amazing results obtained gives perhaps the truest measure of the work performed by these very gallant gentlemen.

Not a spadeful of earth can be turned over or a trowel of cement added to a bastion along the coast but a note appears a day or two later upon the long chart which adorns the record office of this particular squadron. A crumpled escorting machine may have come down out of the clouds, eddying like a withered leaf, to crash somewhere behind the German lines; there may be somewhere near the shore a broken boy in goggles and leather lying amid the wreckage of his last flight. Such is the price paid for a few more dots added in red ink to a couple of feet of chart.

The work of these photographic recorders, pilot and observer alike, differs from all other forms of war flying. Their sole duty is to take photographs, not haphazard but of a given objective. This necessitates steering a perfectly steady course, regardless of all distraction, such as bursting "Archies" and angry Albatross fighters. They leave the fighting to their escorts and their fate to Providence.

The observer, peering earthward through his view finder, steers the pilot by means of reins until he sights the line on which the desired series of photographs are to be taken; once over this the pilot flies the machine on an undeviating course, and the observer proceeds to take photographs. When all the plates have been exposed they turn around and return home with what remains of the escort. On occasions the escort have vanished, either earthward or in savage pursuit of resentful though faint-hearted Boches; this is when the homing photographer's moments are apt to become crowded with incident.

One such adventure deserves to be recorded. It happened about 12,000 feet above Mother Earth. The official reports, typed in triplicate, covered some dozen lines; the actual events, an equal number of minutes; but the story should live through eternity.

"While exposing six plates," says the official report of this youthful recording angel, "observed five H. A.'s cruising." H. A. stands for hostile aeroplane. "Not having seen escort since turning inland, pilot prepared to return. Enemy separated, one taking up position above tail and one ahead. The other three glided toward us on port side (observe the navy speaking), firing as they came.

"The two diving machines fired over 100 rounds, hitting pilot in shoulder." As a matter of sober fact, the bullet entered his shoulder from above and behind, breaking his left collarbone, and emerged just above his heart, tearing a jagged rent down his breast. Both his feet, furthermore, were pierced by bullets, but the observer was not concerned with petty detail.

"Observer held fire until H. A., diving on tail, was within five yards."

Here it might be mentioned that the machines were hurtling through space at a speed in the region of 100 miles an hour. The pilot of the H. A., having swooped to within speaking distance, pushed up his goggles and laughed triumphantly as he took his sight for the shot that was to end the fight. But the observer had his own idea of how the fight should end.

"Then shot one tray into pilot's face," he says with curt relish, "and watched him stall, sideslip and go spinning earthward in a trail of smoke."

He then turned his attention to his own pilot. The British machine was barely under control, but as the observer rose in his seat to investigate the foremost gun fired and the aggressor ahead went out of control and dived, nose first, in helpless spirals.

Suspecting that his mate was badly wounded in spite of this achievement, the observer swung one leg over the side of the fusilage and climbed onto the wing—figure for a minute the air pressure on his body during this gymnastic feat—until he was beside the pilot. Faint and drenched with blood, he had, nevertheless, got his machine back into complete control.

"Get back, you ass!" he said through white lips in response to inquiries as to how he felt. The ass got back the way he came and looked around for the remainder of the H. A.'s. These, however, appeared to have lost stomach for further fighting and fled.

The riddled machine returned home at 100 knots, while the observer,—having nothing better to do, continued to take photographs. "The pilot, though wounded, made a perfect landing." Thus the report concludes.—*N. Y. Herald*, 9/9.

MR. ARTHUR POLLEN ANALYZES U-BOAT LOSSES.—In the *New York Times* of August 19, in an article headed "Lloyd George's U-Boat Figures Contradict Pollen's Gloomy View," it is stated that whereas I had pointed out that the world was losing tonnage at the rate of 9,000,000 a year and replacing it only at the rate of 3,000,000, the British Premier had stated that since the beginning of the ruthless submarine campaign the net losses of British tonnage had been but 250,000 a month. The contradiction is apparently very great. But it can be explained.

In the first place, the article of mine from which the quotation was made was written in the first week of July, and the only figures available to me then were those from the first of February to the end of May. Of June I only knew the totals of ships sunk, and, assuming the displacement per ship to average as in previous returns, I published the figures quoted. It should, of course, be understood that the British Government has never published the weekly tonnage nor the monthly tonnage of her losses, and for authentic figures we have had to rely on one statement delivered at the Chamber of Deputies, and on various statements confirmatory of this matter by members of the American Shipping Board, occasional writers in the Liverpool and other papers that are particularly interested in shipping, etc. From these indications the following broad statements seemed to be true:

Of the four months, February, March, April and May, April showed the highest British loss of 560,000 tons. The lowest loss was over 420,000 tons. The four months then averged about 450,000 tons. June was not far below the lowest month in total of ships sunk, so that it seemed probable that the mean of the five months would not fall below 420,000 to 450,000 tons. This is confirmed by the Premier's statement that in July the tonnage loss fell to 320,000 tons.* Supposing the average of the end of June to

* Lloyd George gave this figure for June, not July.—Ed. Note.

be 420,000, and July to be 320,000 tons, the average loss of the first six months would be 403,000 tons. I think the statement attributed to the British Premier, namely, that the net loss since the commencement of the German submarine warfare was under 250,000 tons a month, cannot be correctly reported. For, if from the 2,420,000 tons lost we deducted the 848,000 tons built and acquired, the net monthly loss comes out at 320,000 tons. The explanation is probably this: Taking the present rate of loss, and taking into account the new tonnage built and the tonnage purchased, a loss of 250,000 tons a month is to be expected by the end of the year.

But it is, of course, a fallacy from the point of view from which my article was written to count in tonnage purchased by Great Britain as a mitigation of the loss inflicted by the German submarine. I was dealing not with the amount of British shipping, but with the total amount of the world's shipping.

To transfer a million or a million and a quarter from one ownership to another does not, of course, add anything to the total. It may add to the effective total because tonnage under British ownership means tonnage under war management. It can be better protected because it all comes under the immediate orders of the Admiralty and so receives the secret instructions that are based on the latest news of the submarine whereabouts, and, being under the orders of the shipping controller, is used more economically, is turned round, as they say, more rapidly, and, what with one thing and another, fetches and carries more cargoes in the year than if it remained in neutral ownership. But when all is said and done, it is not an addition to the world's shipping and, therefore, leaves my argument untouched.

Now, to go back to the main case. When I wrote, the indications were that Great Britain was losing an average of 400,000 tons a month of shipping sunk by mines and submarines. To this must be added an average of one-fifth or more—80,000 to 100,000 tons—of ships struck by mines and submarines but not sunk. Such ships may take anything from one month to six months to repair, and fall into the same category, therefore, as casualties from wounds in war. They are not net and final losses from a fighting force, but they are very serious temporary losses; and, assuming as I had to do in my article, that the submarine successes would continue as in the previous five months they had begun, one had to count at least between three and six months of these disabled ships as constantly withdrawn from the merchant fleet. In effect, then, at any moment after a year of submarine war there would be a net deduction of a further 400,000 tons of British shipping. The gross loss of British shipping then would be from between 4,500,000 and 5,000,000 tons per annum.

For the tonnage of neutral and allied losses we have had to rely upon French, Swedish, Norwegian and Danish publications, issued at various periods between the end of March and the middle of May. From these it appears that the non-British losses were sometimes as low as 50 per cent and sometimes as high as 65 per cent of what we were losing. Taking the low figure, the gross world's loss of shipping would at the lower rate be between 7,000,000 and 7,500,000 tons, and at the high figure would be between 8,000,000 and 9,000,000 tons. After I arrived in America the chairman of the Emergency Shipping Corporation issued a statement, in which he said—this was toward the end of June—that the then rate of loss was 9,000,000 tons a year.

I arrived at the net loss by assuming that the United States and the Allies would build 6,000,000 tons between February, 1917, and February, 1919. I gather from Lloyd George's statement that, in the first half of this period, Great Britain will have built less than one-sixth of this amount. I had estimated Great Britain's share in this period to be much more than double this because, in a speech delivered some months ago, the Premier stated that he expected this year to get from the English shipyards more than twice the tonnage that was added to the British fleet last year. In

1916 more than 750,000 tons were built in England, Scotland and Belfast. I reckoned, therefore, on 1,500,000 as Great Britain's share this year and on half this amount for the United States and the Allies. That would give 2,250,000 tons added before February, 1918, and I hoped for an addition of 50 per cent to this before February, 1919. But if Great Britain is to build only half its quota this year, I fear my estimate of 6,000,000 tons to be added cannot possibly be realized. Had the February-June rate of destruction continued, therefore, the net loss of tonnage would have been not less but greater than my estimate.

The really good and important news in Lloyd George's speech is that the activities of the U-boat are being effectively curbed. I sincerely hope that the real reason why the British output of merchant tonnage is less than Lloyd George's first estimate is that a far greater proportion of our shipbuilding capacity has, since the end of February, been deflected from carrying tonnage to patrol tonnage. I urged this policy very strongly in England in the month of March, when it had become clear that there was no possible hope of our being able to build ships as fast as the Germans seemed able to sink them. It is possible that the adoption of this policy, at any rate in part, explains the lessened success of the U-boats at the present time.

A final word upon your headline. I do not object to the phrase "Pollen's gloomy view," but I would have preferred the statement "Pollen's gloomy figures." My view is, and always has been, that if the naval resources of Great Britain were used to the best effect there would be no grounds whatever for pessimism. When the British and French resources were added those of the United States of America, I became more and more confident that the U-boat menace could and should be successfully met. And by naval resources I do not mean only ships and guns or the industrial capacity to build mines, bombs, depth charges, nets, etc., but what seems to me assets of far greater value, viz., professional knowledge and tactical resource and strategical inspiration, which might, under a sound system of administration, be made available in the higher naval command of the allied side.

Already in Great Britain we seem at last to be in a fair way to approximate our naval administrative organization to the needs of the situation. The most successful administrator that the war has produced has been made First Lord of the Admiralty, and he has already made some highly important changes in the personnel of his professional advisers. These changes are no doubt only the beginning of wider changes.

Progress, reform, and indeed revolution in this matter can hardly go too far. The military policy of the Allies has for more than two years now been subject to periodic revisions by conferences in which the political and military chiefs of England, France, Italy and Russia have met together to discuss the situation and have agreed upon new departures to meet whatever new developments our own or the enemy's actions have brought about. The share of the United States in these conferences, if so far not very conspicuous, must become more and more important as her military power develops. These conferences have a real value because each of the Allies has vast military forces and vast military experience, and consequently an enormously high percentage of the brain power of each country is solely devoted to the consideration of military problems.

But the conferences on naval affairs have been both fewer and far less real. This is because Great Britain, from the overwhelming size of her fleet, which corresponds with the overwhelming character of her scale in the naval war, has practically dominated the naval situation. And there has been, therefore, only little chance for effective naval criticism or suggestion.

From the first day that the United States came into the war, I have been looking forward to a modification of this state of things. I have hoped and urged that this country, whose effective intervention in Europe depends

entirely upon the integrity of its sea communications, would constitute a naval mission and send it to London with instructions to master the whole situation and so contribute to the naval strategy of the war an instructed, impartial, and impersonal view of the right strategy at the present juncture. If, as Mr. George implies, the submarine menace is now in reality diminished, if, in consequence, the sea communications of this country and the Allies can be maintained until the total force of France, Britain and America in France is sufficient to break down Germany once and for all, then, no doubt, the need for an infusion of American inventiveness and resources into the naval direction of the war is less urgent. But until the full text of Premier Lloyd George's speech is available, I am unable to realize just what the facts are on which his confidence is based.—*N. Y. Times*, 26/8.

MR. LLOYD GEORGE ON THE U-BOAT CAMPAIGN.—Giving for the first time actual totals of shipping tonnage lost from month to month through Germany's submarine campaign and estimates of the food supply. Premier Lloyd George, in the House of Commons, proved to Parliament and the country that the Admiralty plans for dealing with the U-boats have been increasingly successful, and that "with reasonable economy" there is no chance of England being starved out. Enthusiastic cheering greeted his revelations.

The Premier said he agreed that the people of the country were all the better for being told even unpalatable truths. But they also must be told the truth even if it was palatable. They could not exercise reasonable judgment or come to decisions regarding facts unless both the cheery and discouraging sides were presented to them.

He purposed to deal with the food situation and submarines because special efforts were being made to create an impression not justified in the least by the facts. Earlier in the year he had called attention to the very anxious condition of the food supply. Since then, owing largely to the energetic efforts of Baron Devonport, the form food controller, and organization by the shipping controller, the situation had improved considerably.

At this time last year, he said, the wheat in this country amounted to 6,480,000 quarters, and that now it was 8,500,000 quarters. (A quarter is equivalent to 480 pounds.) The stock of oats and barley also was higher.

There had been a considerable saving in bread consumption, and owing to closer milling and food economy there had been an addition to the wheat stock of 70,000 quarters per week. Moreover, there had been an increase in the sugar reserve.

Wheat under cultivation showed an increase of 1,000,000 acres. It was too early to give a prediction on this year's harvest because everything depended on the next two or three weeks. If the harvest was good—as it promised to be—and the weather not particularly capricious, the condition of the country regarding food supplies, taking everything into account, was very satisfactory. He still urged economy in view of the general wheat position. The more the country economized the less it would have to draw upon the reservoirs of the United States and Canada, from which Italy and France also had to draw.

The necessary labor for the harvest would be forthcoming, and by spring there would be 8000 tractors.

Dealing with the shipping situation, the Premier said that Germany had been circulating figures regarding the destruction of shipping. They were doing it in Germany to cheer up their own people and were circulating a set of figures throughout Germany and Austria on the authority of the German Admiralty with the object of creating the impression that England could not last much longer.

The unrestricted submarine campaign began in February, and by April England had lost 560,000 tons of shipping in one month. The German official figures, he added, claimed that England was losing between 450,000

and 500,000 monthly after allowing for new construction. The figures of 560,000 tons for April was gross. In June the losses had fallen to 320,000 tons gross, and if the improvement were maintained those for July and August would be 175,000 each.

Steps had been taken for quickening shipbuilding, and a good many ships had been ordered abroad. In 1915 the new tonnage built was 688,000 tons. In 1916 it was 538,000 tons. For the first six months of this year it was 480,000 tons. The tonnage acquired during the last six months would be 1,420,000, of which 1,100,000 had been built in Great Britain. The total for the year would be 1,900,000 tons. A considerable addition also had been made in the program of naval construction.

The shipping controller so far had organized shipping by means of better loading and hiring of ships more quickly and by taking ships off longer voyages. Thus, although the tonnage was diminished, they were carrying more tons.

Premier Lloyd George said he believed the shipping losses would grow smaller. He was sure construction would increase if more ships were still needed. If the United States put forward her full capacity, as he had no doubt she was preparing to do in her own thorough way, there would be sufficient tonnage not only for the whole of 1918, but, if necessary, for 1919.

The Premier said he would not exchange the military situation with the enemy, adding: "Our difficulties will diminish and our power will increase. The enemy's difficulties will increase and their power diminish."

Mr. Lloyd George then read a message from Field Marshal Haig about the fighting in Flanders, and concluded:

"This is the supreme hour for patience, for courage, for endurance, for hope, for unity. Let us go through this hour with a temper that will enable us to destroy a great military despotism. Let us go through this hour with the old temper of our race, so that next year we shall begin, and then the world will begin, to reap the fruits of our valor."

Former Premier Asquith said that Great Britain could survey with satisfaction, if not with complacency—for who could survey complacently the scene now presented to the civilized world?—the results of her own effort. What had happened in Russia had frustrated one of the greatest military purposes of the Allies, and any criticism passed on this year's operations must bear in mind that important consideration. Mr. Asquith added:

"I hope that before long our Russian Allies, whose work in the first two and a half years of the war furnished a glorious and inspiring chapter, will resume to the full their share of the great common task to which I believe the Russian nation still is devoted."

Kennedy Jones, former director of food economy, declared that friends of Germany had begun the present peace offensive and that the time had come when an end ought to be made to it by a decided and clear statement to the mischievous suggestions that Great Britain might be ready to make an inconclusive peace. He believed that Germany, despite internal trouble, would be able to hold her people together by iron discipline. He said the blockade could not have a decisive effect unless the pressure became greater.

This being the last business session of the House prior to adjournment to October 16, Noel Billing asked whether Premier Lloyd George could give assurance that in the event of a "social, military or political crisis" during the recess, steps would be taken to reassemble Parliament. Chancellor Bonar Law replied affirmatively.

Mr. Billing asked whether Parliament would be reassembled in the event of an armistice.

"I should consider an armistice a crisis," the Chancellor replied.—*N. Y. Times*, 17/8.

VICE CHANCELLOR HELFFERICH ANSWERS MR. LLOYD GEORGE'S SPEECH.—Vice Chancellor Helfferich, in the course of the recent debate in the Main Committee of the Reichstag, said the real reason why Great Britain entered the war was the fact that Germany's trade in 1917 presumably would have reached the level of Britain's.

"This war," the Vice Chancellor said, "is the result of tension created by the fact that Great Britain was constantly feeling the glaring and increasing disproportion between her superior world and naval power and Germany's increasing economic strength. One ought clearly to recognize that Great Britain's object was our economic oppression. To abandon one's self to any illusion in this respect would be fatal."

Dr. Helfferich repudiated as unjustified the reproach that he ever had made any prophecies respecting the efficacy of the German submarine warfare.

"Prophesying," he said, "I leave to Great Britain. Premier Lloyd George's statistics in his latest speech are mere humbug. If the British Premier, contrary to his declarations in April, now draws a favorable picture of the situation—although it certainly has not become more favorable—this proves, first, that public feeling in Great Britain urgently needs to be comforted, and, second, that Lloyd George considers it necessary to play upon German public opinion.

"This impression is confirmed by the obvious consideration that Premier Lloyd George's words can only be explained by the same direct menace which operates, despite the prospect of American aid, in the tremendous dash on the western front, with an immense concentration of men and material. This menace is not so much on land or in the air as it is in the water.

"The opinion, shared by Mr. Lloyd George, that fine weather is particularly favorable for U-boat activity is a mistaken one. Smooth seas and lulls in the wind are very disagreeable for U-boats, especially in view of the enemy's defensive measures, regarding aircraft in particular. Some U-boat commanders are of the opinion that submarine warfare can be carried on with still better results when the weather is not too fine and the nights are longer.

"The navigation of ships under escort obstruct the scope of the U-boats, of course, but it also involves considerable disadvantages for the enemy, owing to the fact that such a flotilla is unhandy and has difficulty in eluding a submarine attack quickly.

"As sea traffic diminishes, sinkings, of course, will probably decrease gradually. To-day the sinking of even a single ship is felt much more intensely by the Entente than at the beginning of the U-boat war.

"The statements of our naval staff respecting the tonnage resources of Great Britain may be regarded as exact. Mr. Lloyd George's statements are artificial manipulations of figures. He mixes net and gross losses, anxiously avoiding definite particulars as to total British losses in tonnage. It is interesting to note his remark that all tonnage sunk among that requisitioned for the military must be compensated from tonnage available for commercial purposes. His statement respecting British shipbuilding must be viewed with the utmost doubt.

"For continuation of the U-boat warfare all materials and the personnel required are ready in ample measure, so that, in a military aspect, there cannot be any doubt that it will be continued efficiently."—*N. Y. Times*, 25/8.

SHIPPING LOSSES.—The following article by Charles H. Grasty appeared in the *New York Times*, September 10:

In view of the American peculiarity of being able to put forth the best efforts when the people know what they are up against, certain facts about the submarine campaign, which now constitutes the most menacing phase of Germany's attack on world civilization, are herewith given. They can

be relied on as accurate. It is not thought necessary to deal in figures below thousands.

Following, in terms of tonnage, are the monthly sinkings by German submarines from January to August inclusive, the figures being for the Allies and neutrals in the aggregate, but not including raider losses and ships damaged or beached but not sunk. The weekly averages are given for purposes of comparison:

Month	Tota Tonnage	Sunk Weekly
January (four weeks)	333,000	83,000
February (four weeks)	479,000	120,000
March (five weeks)	600,000	120,000
April (four weeks)	788,000	197,000
May (four weeks)	549,000	137,000
June (five weeks)	758,000	152,000
July (four weeks)	463,000	116,000
August (five weeks)	591,000	118,000
Total	4,561,000	.....

Against the loss of about four and a half million tons in eight months new construction is estimated at less than a million tons, leaving the net loss to allied and neutral shipping at about three and a half million tons. The loss to American shipping is said to have been less than one-half of 1 per cent.

While the decline in the shipping loss in July and August was substantial, it cannot be regarded as satisfactory, and the situation continues to call for the kind of activity demanded by a great emergency. America's opportunity for service lies more immediately and urgently in the direction of putting down the submarine menace than even in sending soldiers to France, all-important as that is. In fact, these two matters are inseparably connected.

As submarine attack and defence are reduced to a business, a good deal of mystery surrounding the war under water is clearing up and commonplace facts are becoming known. The popular mind pictures the waters off the British coast as swarming with submarines. It is a matter of general knowledge in naval circles now that the number of German submarines in the Atlantic Ocean never exceeds 20 and that the number operating in the North Atlantic off the British coast does not exceed 10. These figures do not include submarines engaged exclusively in mine-laying.

It is estimated in the best British naval circles that Germany has not built as many as 300 submarines altogether, and that about 150 of all conditions are in existence to-day.

The U-boat is of very delicate mechanism and needs frequent repairing, which, in the main, explains the small number operating in the Atlantic and elsewhere. Most of the boats are being repaired or replenished constantly and out of commission.

Still another reason is the difficulty in getting crews and keeping them going. The work is so hard and the dangers are so constant that officers and crews peter out. After a few months the men lose their appetite and cannot sleep.

The internal arrangements of a submarine are such as to make life on one of them extremely trying. Plumbing fixtures, kitchens and eating facilities are jumbled together, and ventilation is necessarily bad. It is very difficult to maintain whole crews in service.

Another difficulty and one constantly increasing is the shortage of material for torpedoes. Wild shots are much more frequent than formerly.

The multiplication of destroyers has greatly increased the nerve-racking character of submarine duty. U-boat navigators are deathly afraid of the

destroyers, with their speed, guns and depth bombs. The presence of destroyers and other patrol boats in force in the English Channel explains the immunity of transports which have carried millions of soldiers back and forth between France and England without serious loss.

Another submarine weakness which impedes operation and shakes the nerves of U-boat men is the blindness of their craft. When submerged they cannot see, and there have been many collisions. For this reason they cannot operate in companies, which furnishes still another explanation of the small number utilized.

As is well known, the submarine, when submerged, must keep in motion, as it cannot otherwise maintain its equilibrium. When it stops it is liable to "up-end."

It is clear, therefore, that the submarine campaign, as it now stands, is one depending upon hysterical courage. Germany lashed herself into a spasmlike fury in the early months of last winter, and the peak of her effort was reached in April, when the sinking aggregated about 200,000 tons a week. In order to accomplish this extraordinary result extraordinary means were used which it was impossible to sustain in subsequent months. The comparatively low figures of July and August represent, to some extent, the reaction from the high pitch of energy in April.

There are many reasons for believing, however, that the Germans are preparing for a new burst of effort. They are thought to be concentrating all their naval potentialities in constructing and manning U-boats which, so far as possible, will overcome the weaknesses made manifest by experience.

England learned to cope with the initial activites of the submarine, and when the danger of this menace had been solved by the British Admiralty, Germany addressed herself to the development of a submarine campaign that could be carried farther out to sea and so escape various forms of counter-attack that England had been using. When she was ready for the new campaign she was able to operate for several months against an unprepared enemy, and, indeed, it was not until America sent a destroyer fleet that the thorough convoy system as now organized could be attempted.

While it is too early for optimistic views of the outcome, one hears on all hands in London expressions of gratification at what the United States has done, and especially at the continued energetic measures which Secretary Daniels has taken in protecting allied shipping against the submarine. These measures are the basis upon which rests the main hope in naval circles here of solving the problem.

There is much that America can still do out of her great resources, but her action already has been vigorous and telling. The vessels now maintained by the United States are said to constitute a large proportion of the anti-submarine forces in the Atlantic.

There is much gratified comment here on the action of Washington in placing increased orders for the construction of destroyers, and the period subsequent to January 1, 1918, is looked forward to confidently. The next four months are necessarily to be a time of anxiety and America is relied upon fully to employ her superb energy and resourcefulness in protecting allied interests during that dangerous period.

It is remarked here that, barring the scare it might give to a few seaboard cities, nothing better could happen from the viewpoint of submarine defence than for Germany to divert some of her undersea craft to America. U-boats operating off the coast of Ireland get at shipping where it is concentrated, whereas in American waters it is scattered. Unfortunately, despite the reports printed in some American newspapers, there is no danger that Germany will commit such a blunder.

The principle of the convoy system has been soundly established by the experience of the last few months. Naval authorities hold that it is clear that shipping can be protected by escorting vessels. It is only a matter of having enough cruisers and destroyers. With an adequate number of

these vessels the destruction of shipping can be reduced to the point of new construction and whenever that is done Germany will bite the dust.

Destroyers as Convoys.—Naval officers intimately identified with our overseas operations agree with the statement made by Charles H. Grasty in his London dispatch to the *New York Times* that the U-boat menace will be ended when there are enough cruisers and destroyers available to convoy all ships.

Providing destroyers is considered the crux of the situation. The experience of both British and American naval officers actually engaged in the quest of the German undersea boat is that the destroyer is the deadliest foe of the submarine, and for this reason the Navy Department is concentrating on the construction of as many destroyers as can possibly be built under a very intensive construction program.

It was in support of this belief that Secretary Daniels submitted to Congress estimates for an additional emergency appropriation of $350,000,000 to be used in building more destroyers. He has approved plans for doing everything within the ability of the government to double the number of destroyers actually commissioned or under construction at the present time.

The figures regarding shipping tonnage sunk by German submarines thus far this year, cabled by Mr. Grasty, showing that from January 1 to September 1 the total losses from U-boat operations aggregated 4,561,000 tons in a period of eight months, were accepted as supporting the conviction of naval experts here that the destroyer program should be pushed as rapidly as possible, so as to cut down this toll.

At this rate the total depredations from U-boats during the calendar year 1917 would be 6,841,500 tons. The average value of this shipping probably is not less than $200 a ton, which would mean that the value of the world's merchant shipping sunk by U-boats during the first eight months of the present year is somewhere around a billion dollars.

The figures submitted by Mr. Grasty for losses covering all belligerents and neutrals, coupled with the figures presented in Parliament on August 16 by David Lloyd George regarding British submarine losses, are accepted as marking the crest of the German U-boat warfare. With the passing of summer, which favored U-boat operations with clearer skies and longer days, there would naturally be a dimunition of tonnage loss, and as greater measures of protection and precaution are being taken by the merchant vessels, whether convoyed or not convoyed, as more merchant vessels are armed or using smoke screens, as more vessels are convoyed from month to month, while the destroyer is increasing its aggregated effectiveness, it is believed that the figures for the next three months will show lower tonnage losses.—*N. Y. Times,* 10/9.

BRITISH FOOD CONTROLLER COMMENTS.—Baron Rhondda, the food controller, in an interview with the London correspondent of the Amsterdam *Handelsblad,* declares that the submarine campaign is no longer causing anxiety regarding England's bread supply.

"In one respect," remarked the food controller, "the submarine campaign is a blessing. It has acted as a stimulus to cultivation, so that within a year the United Kingdom will be practically independent of imports, so far as the chief foodstuffs are concerned."—*N. Y. Times,* 10/9.

BRITISH CITE EIGHT SEA FIGHTS.—Stories of some recent successes of the British Navy against German submarines were made public September 14 in a series of brief descriptions of eight encounters in which eight, and possibly nine, U-boats were accounted for. These eight sea-battle pictures were selected so as to cover virtually the whole ground of anti-submarine activities.

In one case there was a battle between an auxiliary cruiser and a submarine; in another, an engagement between a seaplane and a submarine;

then a battle between two submarines, in which the British submarine captain proved himself the better man; and finally two tales of successes of armed merchantmen against the enemy.

First.—From one of our auxiliary naval forces a torpedo was seen approaching on the starboard beam. It jumped out of the water when a hundred yards off and struck the engine-room near the water-line, making a large rent and flooding several compartments. A starboard lifeboat was blown into the air, pieces landing on the wireless aerial.

Soon after a periscope was observed just before the port beam. It turned toward the ship, but quickly disappeared as the enemy further submerged. Again it appeared and was followed this time by the conning-tower. Fire was opened and the first shot hit the base of the conning-tower and removed the two periscopes. Many other hits were obtained and the submarine quickly assumed a list to port and several men came out of the hatch.

The U-boat wallowed along for a space with the stern almost submerged and oil squirting from its side, and the crew came on deck and waved their hands. At this sign of surrender "Cease fire" was ordered, whereupon the enemy started to make off at a fair speed, hoping to disappear in the mist. Fire again was opened, and a loud explosion took place forward and, falling over on her side, the enemy sank, the last thing seen being her sharp bow, end up, slowly disappearing beneath the water. Two survivors were picked up. Our ship made for harbor.

Second.—One of our small craft sighted an enemy submarine at a distance of 10,000 yards. She maintained her course and five minutes later the enemy stopped and then proceeded toward her. Suddenly he submerged and shortly after a periscope appeared close on the starboard bow for a few seconds and then disappeared. The helm was ported and when over the place where the periscope was seen an explosive charge was dropped.

The vessel circled around and dropped another charge. The explosion of this charge followed after two or three seconds by another much more violent explosion which shook the vessel from stem to stern. The water became black over a large area and a considerable quantity of thick oil and flotsam came to the surface.

Third.—One of our submarines sighted an enemy submarine on the starboard bow and so dived, but after seeing him through a periscope for a few minutes lost sight of him. Our boat came to the surface again, and three hours later saw the enemy on the starboard beam two or three miles away.

Our boat dived to attack, but the enemy altered his course and again was lost to view. His apparent objective being conjectured, our course was altered in the hope of cutting him off, and eventually he again was detected on the port bow, steering as surmised. Our course was altered as necessary, and when a favorable position was obtained a torpedo was fired. A splash was observed close to his stern and a few seconds later the enemy was seen with his stern out of water, smoke hanging around it and the conning-tower half submerged. A minute or two later he disappeared.

Fourth.—A seaplane proceeded to attack an enemy submarine which she observed maneuvering into position to fire a torpedo at a passing merchant vessel. Before the seaplane arrived over the submarine the latter submerged, but three bombs were dropped on the position where he disappeared. Five miuutes later a large upheaval was noticed where the bomb was dropped. This could best be compared to a huge bubble rising some distance above the level of the sea and distinctly visible for a minute or more. There was no further sign of the submarine.

Fifth.—A patrol noticed a wake with a considerable amount of foam travelling parallel with her course a short distance away. She crossed the wake and dropped an explosive charge over it. Almost immediately a second charge was dropped, and after it had exploded another explosion took place. Oil and bubbles came to the surface and on this spot a further charge was exploded.

Two more patrol craft arrived on the scene and released charges. Oil which was still rising after an interval of 12 hours was heavy brown in color and had a smell like petrol.

Sixth.—One of our naval forces hearing gun-fire steered for the position and soon sighted an enemy submarine on her bow. Fire was opened and a hit was obtained. A large explosion resulted, but its effects quickly disappeared to reveal no sign of the enemy. The whole hull and conning-tower were distinctly visible before.

Seventh.—Two submarines attacked a defensively armed merchant vessel. The first submarine fired a torpedo at close range, which missed, and the ship sank her by gun-fire. The second submarine then attacked the ship by gun-fire but was damaged and driven off.

Eighth.—A defensively armed merchant vessel encountered a submarine which endeavored to attack at close range. The vessel opened fire, hitting the submarine twice and causing it to disappear vertically. The sea appeared to boil for a considerable time after.—*N. Y. Herald,* 15/9.

ADMIRAL JELLICOE COMMENTS ON THE SUBMARINE MENACE.—In April last, Sir John Jellicoe gave a very instructive survey of the general naval situation to a representative of the Associated Press of America, and the First Sea Lord has recently supplemented his earlier remarks by means of the same medium. It may be recalled that in dealing with the U-boat campaign, Sir John pointed out that against a submerged attack a host of small craft forms the best protection. "We can use anything," he said, "from destroyers to tugs of any size." At the later interview, the First Sea Lord emphasized this point. He said: "Two urgent needs of the moment are more patrol ships for hunting down submarines and an increased output of merchant shipping, so that the losses at sea may be made good." Stress was laid upon the urgent necessity for supplying these two classes of ships in the message which Sir Edward Carson and the First Sea Lord sent to the Iron and Steel Trades Confederation on July 17, in which document also it was stated that we required to use all our resources to prevent our being threatened with starvation. It is satisfactory to find that in the later interview Sir John asserted that while there is no reason to doubt that the Germans have at sea a far larger number of submarines than they had in February and March, the invaluable assistance which America has rendered has prevented them from reaping the harvest which they anticipated. Thus, while the admiral recognizes that the menace remains a serious one, it is clear he finds the situation to have improved, and that it will continue to do so if the Allies make the best use of their resources.

The absence of any reference in Sir John Jellicoe's statements to aircraft as a means of meeting the U-boat menace has been commented on. It seems probable that the admiral omitted to refer to the supply of aircraft as in the particular connection in which his remarks were made he was dealing with shipping. It is possible also that there may not be the same urgency about the provision of aircraft for anti-submarine work that exists in connection with the output of patrol ships and merchant vessels. If the Admiralty were in want of more machines and pilots they could draw upon the squadrons which are in France, where the need for naval airmen cannot be as vital as it would be for dealing with the submarine menace if the want were felt. It was, indeed, at one time, remarked upon as a surprising fact that while there seemed to be an opportunity for using the units of the Naval Air Service in the North Sea and Channel, a number of them had been lent for use with the armies. That, however, was sometime ago. Dr. Macnamara, answering an inquiry from Colonel Lowther, pointed out that seaplanes had been used for the purpose of meeting food-ships and escorting them into port, but at the same time he did not suggest that there was any regular system of using aircraft for this purpose. It has been conjectured, however, that at the speed which the seaplanes can fly and at

the range of which they are capable, they might be used in large numbers for anti-submarine patrols; but upon this point we have no official guidance.

On this, as on the previous occasion, Sir John Jellicoe dealt with the problem of the Belgian coast. In April the First Sea Lord quoted from Admiral Mahan: "War, once declared, must be waged offensively, aggressively. The enemy must not be fended off, but smitten down." Three weeks ago Sir John spoke of the difficulties in the way of carrying out such a policy from the sea alone. He said that the Germans had applied to this portion of the Belgian coast the same principle of intensive fortification adopted higher up the North Sea and on the island of Heligoland. The coastline, he pointed out, is studded with heavy guns, which in themselves constitute infinitesimal targets at ranges over 20,000 yards, whereat any bombardment could be carried out. The enemy, moreover, made the fullest use of aircraft and smoke screens by way of protection. Ostend, he said, offered the best target, but it can only be attacked at rare intervals, when a favorable combination of wind and weather and sea conditions can be obtained. As to Zeebrugge, it is merely the exit from the island port of Bruges, and there is little at the place itself to hit. At the same time Sir John Jellicoe expressed the hope that the problem which the Belgian coast presents would not prove insoluble.—*The Army and Navy Gazette*, 18/8.

FIGHT ON U-BOATS BEGINNING TO TELL.—New devices applied through co-operation of the British and American naval forces in European waters, have had a perceptible effect on German submarine warfare. In the case of merchant vessels that have had the benefit of the protection afforded by the new devices the losses have been reduced to one half of 1 per cent. The Navy Department is confidently expecting an even greater improvement in the methods of protection.

While officials of the Navy Department are reticent, they are satisfied that American naval vessels have sunk some U-boats—how many the department does not know, but the reports received seem to leave no room for doubt that in several engagements the Americans scored.

The caution of the department in making any statement is due partly to the discovery that U-boats are resorting to subterfuge to give the impression to enemy craft that the submarines have been sunk. The favorite subterfuge is to release, after submerging, a quantity of oil and débris, which comes to the surface and appears to furnish evidence that explosive shells fired at the German underwater boats have been effective.

One apparent result of the American addition to the submarine patrol is that U-boats are operating farther out at sea. This extension may be attributed also, in part, in the opinion of some naval officers, to the larger submarines, with greater steaming radius, which the Germans have built. It is not known positively that there is a larger type of U-boat in operation, but naval officers suggest that only an unusually big submarine would proceed so far out to sea.

No American naval vessel or transport has been injured by a German submarine. This success is attributed to the new methods, which embrace a convoy system put into effect recently. For a time the government was inclined to the policy of letting merchant ships proceed to Europe without convoys, but it has now adopted the British plan of giving the protection of warships to such vessels.

There seems to be the heartiest co-operation between the British and American naval forces in European waters, and naval circles give great credit to the British for splendid activity and assistance.

American naval vessels have found that the "depth charge," which the British are said to have introduced, is one of the most effective methods of dealing with U-boats. The depth charge is a bomb that does not explode until it is a considerable distance under water. It is dropped over places where U-boats have been seen to submerge. While the subterfuge of the

Germans in releasing oil and débris has cast some doubt on the results, the reports from some American naval vessels received in Washington seem to show conclusively that depth charges have sent U-boats to the bottom.

Officials here are much encouraged over the submarine situation. They are preparing to put into operation new and more effective methods, which are expected to bring results soon. Naval men say that German U-boat commanders will learn before long that traditional American ingenuity has not failed in this war.

The effect of the increasing patrol, of the employment of airplanes, and of the addition of new devices to the anti-submarine weapons has been to force the U-boats under water to a greater and greater degree. Their effectiveness is limited in proportion. They cannot run down a merchant ship of average speed if kept under water. They can operate only against ships that almost stumble upon them. And all the time they are under water they are consuming the stored power of their storage batteries, decreasing their range of underwater action and compelling them to come up at night and lie idle on the surface while their oil engines are used to recharge the batteries.

The underwater radius of the average U-boat is less than 150 miles under most favorable conditions. To get that distance it would have to travel at a rate of a very few miles an hour. It is argued, therefore, that if by means of aircraft, destroyers, and all other agencies for the detection of submarines, a zone of 150 miles or less in width could be drawn about the German bases or the entrance of the North Sea in which a submarine could come to the surface only at rare intervals, the Germans would not be able to operate on a scale to threaten supply lines except inside that zone.

Airplanes are being used in conjunction with the destroyer work of the Allies along the French coast and in the English Channel. So far, the American destroyers have not worked with aircraft, but that means of detecting the presence of submarines will be used wherever practicable as the planes become available.—*N. Y. Times*, 31/8.

SUBMARINE CAMPAIGN.—Mr. Charles H. Grasty sent the following to the *New York Times* from London, September 7:

The claim made by Admiral von Scheer that any child could take a pencil and a piece of paper and reckon the destruction of England through the submarine and the general belief in Germany that Hindenburg has only to hold things level while the submarine defeats the Allies, have caused fresh discussion of this all-important question in England, with intelligible figures lacking and only the jargon of sinkings by ships to do on.

"It is a discussion in an intellectual vacuum. The figures published by the *New York Times* on July 19 and showing an average monthly loss of 600,000 tons constitute the only real information that has reached the public for six months. The figures quoted by the Prime Minister in answer to questions by Kennedy Jones, dealt with British shipping only, and in such a way as to be very confusing. I am able to state that since the period dealt with by the figures published in the *New York Times* on July 19, viz., the first six months of the present calendar year, there has been a reduction in the losses at the rate of nearly 150,000 tons a month.

"A number of different elements have entered into this reduction, but undoubtedly efficient American co-operation has been the chief single element in the reduction. The convoy system is working as well as can be expected in view of the shortage in escorting vessels.

"The absurd reports published in several New York newspapers on August 19, and quoting Admirals Jellicoe and Sims as authority for the warning that the German high seas fleet may elude the British cordon and strike with all its strength in American waters, and that a submarine offensive will be inaugurated by Germany on the American side of the Atlantic, are believed here to come from German sources and to be put

out for the purpose of preventing the dispatch from America of escorting vessels which are so much needed to perfect the convoy system.

"Admirals Jellicoe and Sims are both known to hold views absolutely opposed to any such theory as that attributed to them in the publications of August 19. All respectable naval authority here is in agreement with the opinion that the appearance of any kind of German fleet in American waters, or that a serious attack of any sort or description, is utterly out of the question.

"Whether such reports emanate from Germany, or whether Germany's purposes are unwittingly served by the incompetent in America, the fact remains that all naval activities are now centered in the submarine zone in European waters, and it is there that the allied naval effort must be concentrated.

"It would be a mistake to draw too much encouragement from the reduction in tonnage sunk by German submarines in July and August. The favorable showing is partly due to the great effort put forth by Germany in the month of April, when the figures were roundly 800,000 tons in four weeks. In the first six months there were also raider losses aggregating 151,000 tons. The total figures for the six months, including raider losses, were slightly in excess of 3,600,000 tons, not including steamers damaged or beached, but not sunk. Of these losses in the first six months of the year 58 per cent were British, 25 per cent neutral, and 17 per cent allied.

When the losses are 600,000 tons a month and construction is 200,000 tons a month, there is a resultant net loss of 400,000 tons a month; and if this went on long enough Admiral von Scheer would be justified in his statement. We cannot be sure, but we can fairly hope that the reduction shown in July and August will be maintained, but even so, the Allies would still be taking an enormous gambler's risk unless the situation were greatly improved both in respect to reduction in tonnage sunk and construction of new tonnage.

"The next six months will be extremely trying, and it is of the highest importance that every nerve be strained to strengthen convoy protection along the lines laid down by the allied naval authorities. The difference between strenuous concentration of effort for providing adequate escort and a division of resources for a purely imaginary submarine or raider attack by Germany in American waters might prove to be decisive in the success or defeat of Germany's supreme effort with the U-boats.

"America has done well in the submarine campaign, but effort should be constantly increased. It appeals to the American spirit to deal with big realities, and the submarine campaign is the very heart of the European war situation. Everything that I have heard in Switzerland, France, and England confirms my belief that Germany is building her hopes on the submarine, and the very moment that destruction of shipping is reduced to a point anywhere near construction, Berlin will beg for peace."

MASTER OF BRITISH STEAMER "CITY OF ATHENS" BLAMED FOR LOSS OF SHIP.—Advices received here from Cape Town, South Africa, say that a court of inquiry, held recently to investigate the sinking of the British steamer *City of Athens*, in which four American missionaries and a large number of other persons lost their lives, found that the disaster was due to the vessel's striking a mine or mines, due to the captain disobeying steering orders.

From testimony adduced, the court found that the wireless operator was guilty of gross neglect for not recording messages received and for not informing the captain concerning them. The captain was declared to have been guilty of allowing the wireless operator to participate in the decoding of messages, contrary to instructions.

"The court considers," says the finding of the court, "that the vessel was lost as a result of navigating contrary to the Admiralty's advices, the cap-

tain steering a course taking his ship over a danger area instead of as directed by the Admiralty. It is recommended that the captain's certificate be suspended for six months."

The *City of Athens* met with disaster off Cape Town in the middle of August while bound from New York for South Africa and India. In addition to the four American missionaries lost there were 15 other missionaries on board who were rescued. In all, 15 of the 97 passengers and four members of the steamer's crew lost their lives through the sinking of the vessel.—*N. Y. Times*, 4/9.

GENERAL PERSHING'S WARNING.—The tactics employed by the British and French in the great battle of Flanders now in progress were alluded to August 18 by General Pershing as illustrating conditions that must be understood thoroughly by the people of the United States.

"Only by a succession of hard, decisive blows can the war be won," he said, "and our army must be made ready to bear its part in such a campaign. It is vitally necessary that our people should realize this and give the administration at Washington that earnest and united support which will enable it to put an army on the battle-field fully adequate to co-operate with our Allies.

"This is no time for halfway measures or lukewarm efforts; it is a time for big things done in the way that France and England have shown us. They have set an example that can be studied with profit to ourselves. The 3000 miles that separate America from the scene of the war render it less easy for our people at home to understand all that our entry into the war means to them and what the preparations of our army mean to ou allies."—*Army and Navy Register*, 25/8.

SPANISH NAVAL OFFICERS ON ALLIED HOSPITAL SHIPS.—Under a recent agreement with Germany, Spanish naval officers will be posted to hospital ships of the Allies in order to guarantee that these vessels are only used for the transmission of sick and wounded.—*The Army and Navy Gazette*, 18/8.

ANOTHER GERMAN "EXPLANATION."—Lieut. General Baron von Freytag-Loringhoven, chief of the supplementary general staff of the German Army, in an article printed in a German newspaper, says a Copenhagen dispatch to the *New York Sun*, admits the falsity of the German pretension that the violation of Belgian neutrality in the campaign of August, 1914, was due to military and defensive necessity provoked by alleged preparations of the French to invade Germany through Belgium. General von Freytag-Loringhoven writes that, on the contrary, the French originally started to concentrate their armies along their own eastern frontier and made a belated change in their plan only after the German offensive was set in motion through Belgium. He says the Germans profited greatly from the resulting confusion and delay.

After describing the advance of the bulk of the German forces westward—four armies comprising its center and right wing—through neutral Belgium and Luxembourg, beginning August 18, 1914, he says: "The French main concentration was originally accomplished between Belfort and the Belgian frontier, and the first indication that they realized a German advance through Belgium resulted in a shift to the left. . . . . The Entente Allies recognized only on August 17 that strong German forces also were advancing in a wide enveloping movement on the left bank of the River Meuse, where previously they had assumed that only an army of cavalry, strengthened by some infantry, was present. In consequence of the original erroneous concentration directed toward the east, the French fifth army did not succeed in advancing beyond the line of Dinant-Charleroi by August 22 and was forced to content itself with holding the passages of the rivers Sambre and Meuse." The article

proceeds to describe the disastrous effect of the sweep of that unexpected German flood upon successive French armies and the advance to the Marne. General von Freytag-Loringhoven declares that the Germans retreated from the Marne because they were too weak to break through the French lines, but he argues that although final success was missed there, Germany, by seizing the opportunity of a daring advance through Belgium, avoided war on her own territory. The newspaper says that the article of General von Freytag-Loringhoven is circulated semi-officially in the German press.—*Army and Navy Journal*, 25/8.

"NEXT WAR" TALKED OF BY GERMAN GENERAL.—General von Liebert, in a speech at Rathenow, Prussia, is quoted by the *Deutsche Tageszeitung* as saying:

"We cannot sign a peace before we have the Flanders coast, a colonial mpire, and maritime bases. Should we not realize it now, we must prepare to work for it after the war in view of the next war."

General Liebert's speech was loudly cheered by his hearers, but it was criticized by the German press. *Vorwärts* commented thus:

"This may prolong the war until Germany has been so beaten that even our Pan-Germans cannot think of a 'next time.'"—*N. Y. Times*, 20/8.

OUTLAW GERMAN SEAMEN.—At the session of the Convention of Seamen representing several Entente and neutral countries, it was proposed that Germans be debarred forever from sailing on British ships. Sympathy was expressed for neutrals on account of their difficulties in maintaining neutrality in the face of such cruel and unscrupulous acts as those of Germany at sea.

The Germans were denounced for ignoring the law of the sea and refusing to succor those in peril. The seamen declared they were still unwilling to carry Socialists to the International Stockholm Conference, but were awaiting the time when they could carry delegates from victorious allied armies on the way to Berlin.—*N. Y. Times*, 19/8.

ARGENTINA LIFTS BAN FOR BRITISH CRUISER.—The Argentine Government has decided that it will not enforce, in the case of a British cruiser, the neutrality regulations limiting to 24 hours the stay of a belligerent warship at a neutral port.

This rule already has been abrogated by Argentina in favor of the United States.—*N. Y. Herald*, 31/8.

PERUVIAN PORTS OPEN TO THE UNITED STATES.—Peru has lined up behind Uruguay and Argentina in supporting morally the United States in its war against Germany and in opening its ports to American warships during the war. Secretary Lansing received and made public, August 23, the text of an address which President Pardo of Peru recently delivered before the Congress of the nation, in which he said, in part:

"President Wilson, in his message read before the American Congress on the 2d of last April, set forth the motives of intervention of his country in the European war and the plans pursued to save the principles of peace and justice in the world, declaring that the United States would be satisfied only when they have consolidated the faith in liberty which the nations can give, adding that they will fight for the triumph of democratic rights, for the liberty of those who are living under oppression and have no voice before their governments, for the rights and liberties of the small nations, for the universal domination of justice, and because the concert of all the people carry and assure peace and humanity, and may make the entire world positively free.

"Peru, which in all its acts of international life has endeavored to incorporate these principles of justice in the judicial and political relations of the American people; Peru, which in a war not far back sacrificed for these

ideals the blood of its sons, the richness of its treasuries, and the hope of its future, cannot be indifferent to the words of President Wilson, and adheres once more to such noble purposes."—*N. Y. Times*, 24/8.

GERMAN AIRMEN BOMB HOSPITALS.—About 10 o'clock Sunday evening, August 19, two German aviators flew over two hospitals behind Verdun, which are joined by a wooden bridge over a road separating the buildings. Four incendiary bombs which were dropped set fire to three wooden wards which were crowded with wounded.

As the personnel were making an effort to save from the fire the survivors who had not been killed by the projectiles, the German airmen returned and from a low altitude turned their machine guns on the men and nurses who were cutting the bridge to prevent the fire from spreading, killing 7 and wounding 20.

The Red Cross workers on the building could be plainly seen in the light made by the blazing fire, but the raiders returned for a third time and dropped bombs on and fired their machine guns at the hospitals. Seven wounded soldiers were killed in their beds. Two Red Cross nurses in the wards were killed.

Two other hospitals were similarly bombarded, making a number of victims. One camp where German prisoners were collected also was bombed and many Germans were injured.—*N. Y. Times*, 23/8.

One of the hospitals behind Verdun on which German airplanes dropped incendiary bombs is at Vadelaincourt. The fire caused by the bombs spread rapidly to the whole building, and the glare showed up more plainly than ever the large red cross painted on the roof. The aviator threw a second bomb, which demolished a pavilion in which were three crews of surgeons who were performing operations. The surgeons, nurses and wounded were obliged to quit the building.

At about the same time a German aviator attacked the hospital at Chateau Mont Hairons. The bomb exploded in a ward filled with wounded men, killing one of them.

Ten wounded soldiers were killed on the same evening at Beirupt by a German shell.

Proof of premeditation on the part of the German authorities in making these attacks is furnished by a photograph found on a German aviator brought down at Dead Man's Hill. The photograph represented the Vadelaincourt hospital, with the Red Cross sign indicated clearly.—*N. Y. Times*, 27/8.

SECRET RADIO PLANT DISCOVERED IN PATAGONIA.—Men of the Argentine Navy have discovered on the coast of Chubut (Patagonia) a secret wireless installation. The authorities have seized the plant. It is thought that the station was used to communicate with suspect vessels in the South Atlantic. —*Shipping*, 8/9.

EXPLOSION AT FRANKFORD ARSENAL.—Through an explosion in one of the buildings known as detonating dry rooms, 3 men were killed and 21 persons were injured at the Frankford Arsenal on September 8. The explosion is believed to have been due to the accidental dropping of a tray of detonators, which wrecked the building in which primers and detonators for 3-, 4- and 6-inch shells were dried. Eighty thousand detonators recently completed were set off and the fire which followed destroyed three small structures adjoining. The total loss is placed at $20,000.—*Army and Navy Journal*, 15/9.

HOW REVENUE WILL BE RAISED.—Here are the revised estimates of the revenue expected annually from the new War Revenue Bill, as amended:

Income tax	$842,200,000
War profits	1,060,000,000
Alcoholic beverages and soft drinks	218,000,000
Tobacco	56,600,000
Rail and water passenger transportation	141,750,000
Automobiles, patent medicines, etc	48,100,000
Admissions to theaters and all forms of entertainments	18,000,000
Stamp tax, etc	22,000,000
Virgin Islands products	20,000
Total	$2,406,670,000

—*N. Y. Herald*, 11/9.

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DIPLOMATIC NOTES

FROM AUGUST 18 TO SEPTEMBER 18

PREPARED BY

A. F. WESTCOTT, PH. D., Instructor, U. S. Naval Academy

PRESIDENT WILSON'S REPLY TO THE POPE.—In a note made public August 29, President Wilson rejected the Pope's proposal for peace negotiations made in his communication of August 1. In substance the President stated that "We cannot take the word of the present rulers of Germany as a guarantee of anything that is to endure," unless explicitly supported by conclusive evidence of the will and purpose of the German people themselves. The message follows:

WASHINGTON, D. C., August 27, 1917.

To His Holiness Benedictus XV, Pope:

In acknowledgment of the communication of your Holiness to the belligerent peoples, dated August 1, 1917, the President of the United States requests me to transmit the following reply:

Every heart that has not been blinded and hardened by this terrible war must be touched by this moving appeal of his Holiness the Pope, must feel the dignity and force of the humane and generous motives which prompted it, and must fervently wish that we might take the path of peace he so persuasively points out. But it would be folly to take it if it does not in fact lead to the goal he proposes. Our response must be based upon the stern facts, and upon nothing else. It is not a mere cessation of arms he desires; it is a stable and enduring peace. This agony must not be gone through with again, and it must be a matter of very sober judgment what will insure us against it.

His Holiness in substance proposes that we return to the *status quo ante-bellum* and that then there be a general condonation, disarmament, and a concert of nations based upon an acceptance of the principle of arbitration; that by a similar concert freedom of the seas be established; and that the territorial claims of France and Italy, the perplexing problems of the Balkan States, and the restitution of Poland be left to such conciliatory adjustments as may be possible in the new temper of such a peace, due regard being paid to the aspirations of the peoples whose political fortunes and affiliations will be involved.

It is manifest that no part of this program can be successfully carried out unless the restitution of the *status quo ante* furnishes a firm and satisfactory basis for it. The object of this war is to deliver the free peoples of the world from the menace and the actual power of a vast military establishment, controlled by an irresponsible government, which, having secretly planned to dominate the world, proceeded to carry the plan out without regard either to the sacred obligations of treaty or the long-established practices and long-cherished principles of international action and honor; which chose its own time for the war; delivered its blow fiercely and suddenly; stopped at no barrier, either of law or of mercy; swept a whole continent within the tide of blood—not the blood of soldiers only, but the blood of innocent women and children also and of the helpless poor; and now stands balked, but not defeated, the enemy of four-fifths of the world.

This power is not the German people. It is the ruthless master of the German people. It is no business of ours how that great people came under its control or submitted with temporary zest to the domination of its pur-

pose; but it is our business to see to it that the history of the rest of the world is no longer left to its handling.

To deal with such a power by way of peace upon the plan proposed by his Holiness the Pope would, so far as we can see, involve a recuperation of its strength and a renewal of its policy; would make it necessary to create a permanent hostile combination of nations against the German people who are its instruments; and would result in abandoning the new-born Russia to the intrigue, the manifold subtle interference, and the certain counter-revolution which would be attempted by all the malign influences to which the German Government has of late accustomed the world.

Can peace be based upon a restitution of its power or upon any word of honor it could pledge in a treaty of settlement and accommodation?

Responsible statesmen must now everywhere see, if they never saw before, that no peace can rest securely upon political or economic restrictions meant to benefit some nations and cripple or embarrass others, upon vindictive action of any sort, or any kind of revenge or deliberate injury. The American people have suffered intolerable wrongs at the hands of the Imperial German Government, but they desire no reprisal upon the German people, who have themselves suffered all things in this war, which they did not choose. They believe that peace should rest upon the rights of peoples, not the rights of governments—the rights of peoples, great or small, weak or powerful—their equal right to freedom and security and self-government and to a participation upon fair terms in the economic opportunities of the world, the German people, of course, included, if they will accept equality and not seek domination.

The test, therefore, of every plan of peace is this: Is it based upon the faith of all the peoples involved, or merely upon the word of an ambitious and intriguing government, on the one hand, and of a group of free peoples, on the other? This is a test which goes to the root of the matter; and it is the test which must be applied.

The purposes of the United States in this war are known to the whole world—to every people to whom the truth has been permitted to come. They do not need to be stated again. We seek no material advantage of any kind. We believe that the intolerable wrongs done in this war by the furious and brutal power of the Imperial German Government ought to be repaired, but not at the expense of the sovereignty of any people—rather a vindication of the sovereignty both of those that are weak and of those that are strong. Punitive damages, the dismemberment of empires, the establishment of selfish and exclusive economic leagues, we deem inexpedient, and in the end worse than futile, no proper basis for a peace of any kind, least of all for an enduring peace. That must be based upon justice and fairness and the common rights of mankind.

We cannot take the word of the present rulers of Germany as a guarantee of anything that is to endure unless explicitly supported by such conclusive evidence of the will and purpose of the German people themselves as the other peoples of the world would be justified in accepting. Without such guarantees treaties of settlement, agreements for disarmament, covenants to set up arbitration in the place of force, territorial adjustments, reconstitutions of small nations, if made with the German Government, no man, no nation, could now depend on.

We must await some new evidence of the purposes of the great peoples of the Central Powers. God grant it may be given soon and in a way to restore the confidence of all peoples everywhere in the faith of nations and the possibility of a covenanted peace.

ROBERT LANSING,
Secretary of State of the United States of America.

ALLIES REST ON PRESIDENT'S REPLY.—According to Washington despatches of September 8, Great Britain advised the United States that

President Wilson's reply to Pope Benedict's peace proposals was in effect Great Britain's reply.

This decision to stand on the President's message was forecast in a statement by Lord Robert Cecil, British Minister of Blockade, on August 31, in which he expressed the opinion that none of the Allies could improve upon the President's note and that no further reply seemed necessary.

A PEACE "FEELER" FROM GERMANY.—Washington, September 9.—What purports to be an outline of Germany's peace terms has been circulated among diplomats here within the last two weeks, but has been regarded by the Entente Embassies and most of the neutrals as a "feeler."

The origin of the so-called terms was not disclosed, but they are said to have been written by Foreign Secretary von Kuhlmann before his visit to Vienna, which since has been pointed to as strengthening the probability that they bear evidences of authenticity.

Briefly, the so-called terms were as follows:

Restoration of Belgium and northern France, to be paid for out of the sale of Germany's colonies to Great Britain.

Alsace and Lorraine to be independent states. (High French officials recently have stated anew the determination of France to be satisfied with nothing less than the recovery of her lost provinces.)

Trieste to be a "free port."

Serbia and Roumania to be restored, and Serbia to have a port on the Adriatic.

The Balkan question and the status of Turkey to be subjects for negotiation.

Disarmament and international police.

Freedom of the seas, with Great Britain in control of the English Channel until the projected tunnel is built between Dover and Calais.

AN ALLEGED INTERVIEW WITH THE POPE.—London, September 7.—The *Daily News* prints an article by a diplomatic correspondent, dated sometime in August, in the course of which is given the following account of an interview with Pope Benedict:

"Holy Father," I began, "I come to you as a member of a race which like the Jews, has neither temple nor country. Our race is dispersed to the four corners of the earth and our country lies under the iron heel of the invader. All these calamities have been occasioned by—"

The Pope.—"By what, my son?"

Myself.—"By an alliance between the descendants of Luther and the followers of Mohammed."

The Pope with a gesture of impatience.—"Luther, yes; but those Russians!"

Myself.—"Russians?"

The Pope.—"Yes, Russians. They are determined to get Constantinople."

Myself.—"But the Russian occupation of Constantinople will not be absolute. Other Entente powers will have certain spheres of influence there."

The Pope, brusquely.—"Well, well, what do the Entente really want? What is their program? No one knows what they want, and they never show any desire to formulate it concretely."

Myself.—"The program is simple: First of all, disarmament and the annihilation of Prussian militarism."

The Pope.—"But others must disarm also."

Myself.—"Certainly, Holy Father, but the Prussians must do so first. There must be serious guarantees against an offensive return of Prussian militarism."

The Pope.—"And after?"

Myself.—"Restitution of Alsace-Lorraine."

The Pope, with a significant gesture.—"It is quite understood; and after?"

Myself.—"A new Poland must arise. Austria, as we know it, must disappear. New nations will arise from its ruins. The Austrian Germans will be incorporated in the German Empire, where they will reinforce the comparatively liberal non-Prussian elements against Prussia. Of course, Belgium must be evacuated and indemnified."

The Pope, holding up his hands in astonishment.—"What a program!"

Myself.—"It is a program, as I see it, in which there is no need to fear Russia."

The Pope.—"Russia has never been tender to Catholic interests. Look at the way they treated Catholic priests in the diocese of Lemberg, and then the case of Archbishop Szaptyski. It was scandalous!"

Myself.—"The Germans shot many priests in Belgium."

The Pope.—"Certainly, certainly. War produces horrors everywhere."

The Pope finished the audience brusquely, says the correspondent, who then left the Papal library.

In an introductory statement the correspondent says the Pope is not Germanophile, but that distrust of Russia is "an absolute obsession with him." The peace appeal was not dictated by Austria, but Benedict XV is Austrophile.

Three main motives to which the recent Papal appeal is ascribed are:

First, a desire to obtain a seat at the peace congress, at which the question of the temporal power may be reconsidered by the principal world powers.

Second, fear of offending powerful German Catholics, thereby incidentally giving an impetus to the German modernist school at Munich, which before the war had become restive and undisciplined.

Third, fear lest the Austrian Empire, the greatest of Catholic powers, should suffer shipwreck."—*N. Y. Times*, 8/9.

UNITED STATES

CONTROL OF EXPORTS BARS GERMAN SUPPLIES.—Under the Act of Congress of June 15, 1917, giving the executive power to restrict or prohibit exports, President Wilson, on August 27, issued a proclamation supplementing the proclamation of July 9 and placing exports almost completely under government regulation.

As explained in a supplementary statement, the proclamation contained two lists. The first list, applicable to the enemy and his allies and to all neutral countries of Europe and to their colonies and possessions throughout the world, brought under control practically all articles of commerce.

The second list, applicable to all other countries of the world, Allies included, made a number of additions to the list of commodities controlled by the proclamation of July 9. The chief additions were cotton, sugar and lumber.

The proclamation was taken to indicate the adoption of a strict rationing policy to the neutral powers of Europe, as a means of further restricting the flow of supplies from these countries to the enemy. It was stated by the Administrative Board of the Exports Council that the proclamation superseded the agreement by which 30 Dutch vessels with grain cargoes were to sail from New York. The board further stated that none of the northern neutrals could expect a shipload of American wheat before December 1, and then only on conclusive proof of its need and destination for home consumption.

GERMANY

CHANCELLOR FORMS PARLIAMENTARY COMMITTEE.—On August 25 Chancellor Michaelis announced his decision to form an advisory committee, consisting of seven members of the Reichstag and seven members of the Bundesrat, to meet under the presidency of the Chancellor. While the members were to be chosen from the chief parties, they were not to consider themselves merely as party spokesmen or representatives of the legislative bodies. What was intended was a "free committee."

The members chosen from the Reichstag were Fehrenbach and Erzberger (Center), Ebert and Scheidemann (Social Democrats), Payer (Progressive), Stresemann (National Liberal), and Count Westarp (Conservative). The committee met on September 10 to take up its first business, the preparation of an answer to the Pope's note.

While radical elements in the Reichstag accepted the creation of the "free committee" as a slight step in the direction of governmental responsibility to parliament, it was regarded as by no means such "parliamentarization" as the Reichstag majority had in mind.

KAISER'S DIPLOMACY IN 1904-5.—An interesting light on the secret activities of the German Emperor at the time of the Russo-Japanese War was thrown by a series of telegrams between William II and the Czar, recovered from the secret archives at Petrograd at the time of the revolution of last March, and published in the *New York Herald*. The interchange of telegrams between the two emperors without the knowledge of their ministers shows William II actively engaged in capitalizing Russo-British hostility in 1904-5 in the interests of a treaty between Russia and Germany directed against "Anglo-Saxon" domination, a treaty to which France by force of circumstances was to become a partner.—*N. Y. Nation*, 13/9.

FRANCE

FALL OF RIBOT CABINET.—On September 7 the members of the Ribot Cabinet decided to submit their resignations. Premier Ribot was at once called upon to form a new ministry, but failed owing to the refusal of the Socialist party to support a ministry formed in large part of members of the former Cabinet. On September 10 M. Painlevé, ex-Minister of Munitions, undertook with success the task of forming a new government.

The downfall of the Ribot Cabinet is attributed to the scandal in connection with the resignation of M. Malvy, Minister of the Interior, and his dealings with the notorious spy Almeyreda. The Socialists also demanded a Ministry of more democratic policy and more driving force in the conduct of the war.

RUSSIA

ATTACKS ON SOCIALIST CONTROL.—At the opening of the Russian National Conference held at Moscow on August 26-29, Premier Kerensky stated that the purpose of the conference was to give the government an opportunity to present its aims and policies to the nation, but that the Provisional Government would tolerate no political agitation aiming at its overthrow.

At the second sitting, on August 27, General Korniloff was introduced by Premier Kerensky. General Korniloff pictured the demoralization of the army and demanded restoration of the death penalty and other disciplinary measures which would place the army under military control.

Speaking before the conference, M. Rodicheff, one of the delegates, attacked the "Soviet" (Council of Workmen's and Soldiers' Delegates) in the following terms:

"You are demoralizing the masses by telling them to enrich themselves while Russia is helpless. Russia will not sell herself for a mess of revolutionary pottage. We have to save Russia, not the revolution. Russia hailed the revolution in the hope that it would save her, and no power can save the revolution if once that hope is destroyed."

The words uttered by Rodicheff depict the situation in a nutshell. To many millions of Russians this hope has already gone. The peasant proprietors are enrolling themselves into unions of landowners for the defence of the interests of property. The Knights of St. George, representing 80,000,000 acres, have combined in military leagues. All the Cossack and Kirchiz and Caucasian tribes have banded together in defence of their homes and country. There is a solid block far exceeding in size and population the combined strength of the Central Empires. From Lake Baikal to the Dniester, from the Don to the Persian border, loyal sons of Russia are ready to rise against the forces of disintegration and defeat.

General Kaledines, as head of this great league, yesterday boldly threw the gauntlet at the Soviet and its adherents.

"Who saved you from the Boisheviki on the 14th of July?" he asked contemptuously. "We Cossacks have been free men. We are not made drunk by new-found liberties and are unblinded by party or program. We tell you plainly and categorically, remove yourselves from the place which you have neither the ability nor the courage to fill and let better men than yourselves step in, or take the consequences of your folly."—*N. Y. Times*, 31/8.

KERENSKY VS. KORNILOFF.—Following the fall of Riga and the retreat of the Russian armies more than 40 miles toward Petrograd, the dissatisfaction among liberal but non-Socialist elements in Russia culminated in what was apparently an effort to overthrow the Kerensky government and establish General Korniloff with dictatorial powers.

PREMIER KERENSKY'S PROCLAMATION OF SEPTEMBER 10.—Premier Kerensky on Sept. 10 issued the following proclamation:

On September 8 a member of the Duma, M. Lvoff, arrived in Petrograd and called upon me, in the name of General Korniloff, to hand over all civil and military powers to the Generalissimo, who would form a new government at his pleasure. The authenticity of this summons was afterward confirmed by General Korniloff himself, who had a conversation with me over the direct telegraphic wire between Petrograd and main headquarters.

Considering this summons, addressed through me to the Provisional Government, as an attempt by certain quarters to profit by the difficult situation of the country and establish a state of things contrary to the conquests of the revolution, the Provisional Government has recognized the necessity of charging me, for the safety of the republican régime, to take the urgent, indispensable measures necessary to cut at the roots all attempts against the supreme power and rights of the citizens won by the revolution.

I, therefore, for the maintenance in the country of liberty and public order, am taking all measures, which I shall announce at the proper moment

to the people. At the same time, I order General Korniloff to hand over his functions to General Klembovsky, Commander-in-chief of the armies on the northern front, which bar the way to Petrograd, and I order General Klembovsky to assume provisionally the functions of Generalissimo while remaining at Pskov.

Secondly, I declare a state of war in the town and district of Petrograd.

I appeal to all citizens to remain calm, maintain the order necessary for the welfare of the fatherland and the army and navy, and tranquilly and faithfully fulfill their duty in the defence of the fatherland against the foreign enemy.—*N. Y. Times,* 11/9.

GENERAL KORNILOFF SEIZED.—According to Petrograd despatches of September 15, General Korniloff and his staff officers were, on September 14, placed under arrest. In the meantime the forces under Korniloff had submitted to government control and the crisis was apparently at an end.

RUSSIA A REPUBLIC.—Washington, September 17.—The most encouraging feature of the Russian situation, as reported in official despatches to the Russian Embassy received to-day, is the news that the military situation has been greatly strengthened by steps taken by General Alexieff, the new Commander-in-chief, while efforts are being made to adjust the internal political situation. The political contest has been improved by the proclamation of a republican form of government for Russia, and the temporary creation of a smaller Cabinet of five, headed by Premier Kerensky.—*N. Y. Times,* 18/9.

SOUTH AMERICA

GERMANY YIELDS TO ARGENTINA.—Buenos Aires, August 28.—Germany's reply to Argentina's note embodying demands in connection with the submarine campaign as affecting Argentine shipping has been received.

In official circles it was stated that the reply was satisfactory. According to the newspaper *La Razon,* the German note meets all the demands of Argentina.

The note says that Germany "in order to maintain friendly relations with Argentina is willing to modify her blockade of enemy coasts, allowing freedom of the seas to vessels under the Argentine flag carrying food." The note also promised the payment of an indemnity for the sinking of the Argentine steamer *Toro* by a German submarine, this indemnity to be arranged by German and Argentine appraisers. The note which was received by the government last night consists of fifteen pages.—*N. Y. Times,* 29/8.

AMSTERDAM, August 30.—A despatch received from Berlin says that the Argentine Minister has informed the German Government that Argentina regards the incident of the sinking of the steamer *Toro* closed, Germany having agreed to indemnify the owners of the vessel.—*N. Y. Times,* 1/9.

GERMAN SECRET DESPATCHES THROUGH SWEDEN.—On September 8 Secretary Lansing published three despatches from the German Minister at Buenos Aires to his government, which had been forwarded in German code by the Swedish Minister through the Stockholm Foreign Office. The publication of these despatches revealed Germany's high-handed diplomacy in dealing with Argentina, and laid the Swedish Government open to suspicion of unneutral conduct.

The documents and Secretary Lansing's explanatory statement follow:

The Department of State has secured certain telegrams from Count Luxburg, German Chargé d'Affaires at Buenos Aires, to the Foregn Office at Berlin, which, I regret to say, were dispatched from Buenos Aires by the Swedish Legation as their own official messages, addressed to the Stockholm Foreign Office.

The following are translations of the German text:

May 19, 1917, Number 32.

This government has now released German and Austrian ships on which hitherto a guard had been placed. In consequence of the settlement of the Monte (Protegido) case there has been a great change in public feeling. Government will in future only clear Argentine ships as far as Las Palmas. I beg that the small steamers *Oran* and *Guazo*, 31st of January (meaning which sailed 31st), 300 tons, which are (now) nearing Bordeaux with a view to change the flag, may be spared if possible or else sunk without a trace being left ("spurlos versenkt."). LUXBURG.

July 3, 1917, Number 59.

I learn from a reliable source that the Acting Minister for Foreign Affairs, who is a notorious ass and Anglophile, declared in a secret session of the Senate that Argentina would demand from Berlin a promise not to sink more Argentine ships. If not agreed to, relations would be broken off. I recommend refusal and, if necessary, calling in the mediation of Spain. LUXBURG.

July 9, 1917, No. 64.

Without showing any tendency to make concessions, postpone reply to Argentine note until receipt of further reports. A change of Ministry is probable. As regards Argentine steamers, I recommend either compelling them to turn back, sinking them without leaving any trace, or letting them through. They are all quite small. LUXBURG.

ARGENTINA DISMISSES LUXBURG.—On September 13, as an immediate result of the publication of the despatches, with their unconventional characterization of the Argentine Foreign Minister, Argentina handed Count Luxburg his passports and despatched the following note to Berlin:

"The Argentine Government has recognized and valued highly the exalted manner in which the government of Germany has solved in ample terms all the Argentine claims, but must inform the German Government that, because of the texts of Minister von Luxburg's telegrams which have been published, he has ceased to be *persona grata*, and in consequence this government has delivered to him his passports."

SWEDEN TAKES ACTION.—As a result of the disclosures, the Swedish Government announced that it had at once stopped all transmission of German despatches and had requested from Germany an explanation of the abuse of the mail privileges formerly extended. Foreign Minister Lindman, on September 15, made a statement to the press embodying the following points:

First, that the Swedish Government was not, as alleged in certain quarters, taking the affair lightly, but on the contrary, realized fully the serious aspect of the situation and was minded to do everything possible to settle the problem.

Second, that transmission of despatches on behalf of Germany had been stopped absolutely from the moment when the disclosures were brought to the Foreign Minister's attention and would under no circumstances be resumed.

Third, that had the Swedish Government had the slightest idea of the nature of the despatches which the German Government was transmitting, the messages would never have been transmitted.

Fourth, that strong representations had been addressed to the German Government on the abuse made of this practice, accompanied by a request for explanation, to which however, no reply had yet been received.—*N. Y. Times*, 16/9.

SWEDEN AIDED GERMANY IN MEXICO.—Washington, September 13.—The Department of State made public to-night the following translation of a letter, dated March 8, 1916, from the German Minister at Mexico City to Chancellor von Bethmann Hollweg:

Imperial Legation, Mexico, to His Excellency the Imperial Chancellor:

Herr Folke Cronholm, the Swedish Chargé d'Affaires here, since his arrival here, has not disguised his sympathy for Germany, and has entered into close relations with this legation. He is the only diplomat through whom information from a hostile camp can be obtained.

Moreover, he acts as intermediary for official diplomatic intercourse between this legation and your Excellency. In the course of this, he is obliged to go personally each time to the telegraph office, not seldom quite late at night, in order to hand in the telegrams.

Herr Cronholm was formerly at Peking and at Tokio, and was responsible for the preliminary arrangements which had to be made for the representation of his country in each case. Before he came out here he had been in charge of the Consulate General at Hamburg. Herr Cronholm has not a Swedish but only a Chinese order at present.

I venture to submit to your Excellency the advisability of laying before his Majesty the Emperor the name of Herr Cronholm, with a view to the Crown Order of the Second Class being bestowed upon him. It would perhaps be desirable, in order not to excite the enemy's suspicion, to treat with secrecy the matter of the issue of the patents until the end of the war, should the decision be favorable to my suggestion. This would mean that the matter would be communicated to no one but the recipient and his government, and even to them only under the seal of secrecy, while the publication of the bestowal of the decoration would be postponed until the end of the war.

I should be particularly grateful to your Excellency if I could be furnished with telegraphic news of the bestowal of the decoration, which I strongly recommend in view of the circumstances detailed above.

VON ECKHARDT.

Subsequently to the publication of this letter commending the Swedish Chargé in Mexico for a German Order of Merit, the Swedish Minister at Washington announced that Herr Cronholm had been removed from the Swedish Diplomatic Service last January, for reasons not connected with his aid to Germany.

GERMANY OFFERS APOLOGIES.—On September 17 it was announced from Buenos Aires that the German Foreign Office had extended to the Argentine Minister at Berlin oral apologies for the conduct of Count Luxburg. Argentina, however, threatened a rupture with Germany unless apologies were presented in a formal note.

REVIEW OF BOOKS

ON

SUBJECTS OF PROFESSIONAL INTEREST

"Text Book of Naval Aeronautics." By Henry Woodhouse. $6.00 net. (The Century Co.)

Mr. Woodhouse has been intimately associated with and interested in the advance of aviation in this country for many years, and his articles are familiar to and appreciated by most of us. His latest effort meets a long felt want, but especially so from the viewpoint of one interested in naval aeronautics, whether he belongs to any branch of the naval flying corps or to any other branch of the service. Many inquiries have been received from both officers and enlisted men asking for a book which covered the fundamentals and aims of naval aeronautics, at the same time telling what had been accomplished to date, and this book is most admirably suited for that purpose.

It contains 260 excellent illustrations, which in themselves alone make the book valuable and which force upon the reader the realization of what has already been accomplished and what is yet to be accomplished by this country. There are innumerable books on aeronautics, practically all of which are incomprehensible to the layman, and none that cover naval aeronautics so thoroughly. This is the first book that has come to our notice which is so written that it is of value and most interesting to the novice as well as to the expert airman. Facts are told in a clear, concise, readable way, without undue use of technical terms, and yet certain chapters are sufficiently technical for the expert.

Mr. Woodhouse enumerates the uses for which naval aircraft have been employed during the present war, and then proceeds to relate actual occurrences, which in every instance are well illustrated. Next he shows the aerial defences needed to adequately protect the United States, in comparison with what has been found necessary by Great Britain.

For the information of the beginner there are chapters on nomenclature, administration, safety orders and regulations, Rules for the British Flying Corps, training of aviators, courses of instruction and required qualifications of personnel for the Air Service of the United States, regulations relating to enrollments in the United States Naval Reserve Flying Corps, and rules governing tests for the Federation Aeronautique Internationale Pilot Certificates.

Of interest to everyone are the chapters discussing aeroplane guns and aerial gunnery, night flying, instruments for aerial navigation, United States Navy Aeronautics, Naval Militia Aeronautics, Aerial Coast Patrol, evolution of the seaplane and the flying boat, naval dirigibles, and other subjects.

T. G. E.

"The Range of Search-Light Projectors." By Jean Rey, Ingénieur civil des Mines, Lauréat de l'Institute. Translated by J. H. Johnson, M. Inst. C. E., Assoc. A. I. E. E. Price $4.50 net. (New York: D. Van Nostrand Company.)

This book should be of exceptional interest to members of the naval service. Among the practical problems on search-lights are the following: The range and coefficient of atmospheric transparency being known, find (1) the visibility of an armored warship, (2) the visibility of a dark-colored torpedo-boat, and (3) the visibility of a black buoy or of the turret of a submarine; also, the required visibility and coefficient of atmospheric transparency being known, find (4) the range of a modern armored warship and (5) the range of a dark-colored torpedo-boat (problems (4) and (5) are the inverse of problems (1) and (2), respectively), and (6) attack on a coast fortress by a squadron. Table XVI gives the equivalent illumination in lux * necessary for visibility for both land and marine objectives.

In Note C of the Appendix the author calls attention to an optical illusion produced by the illumination from a search-light on observers situated in the beam. Two cases are cited, one of an aeroplane, and a second of some soldiers building a trench. In both cases the observers received considerable light from the search-light, enough light to make them think themselves in danger, but actually entirely insufficient light to make them visible to the enemy operating the search-light. These examples suggest that it would be very desirable for the observer to have some means of knowing when he is sufficiently illuminated by a search-light to be visible to the operators of that search-light. For example, it would be a very valuable piece of information for the captain of a torpedo-boat to know when he was actually discoverable by the enemy's search-lights. Portable photometers, of which there are a number on the market, will measure the illumination due to the hostile search-lights.

This book is unusually well written. It sticks to fundamentals throughout and is not burdened with a host of details as to the mechanism of search-lights. The exposition of the theory is very clear and on a scientific basis. The subject is developed to a practical completion, excellent large scale charts being supplied for the solution of practical problems on search-light ranges.

Although to the English-speaking reader there is a certain consciousness that a translation is being dealt with, this feature is much less objectionable than in many translations. In the fundamental formula,

$$\epsilon_0 = \epsilon_1 \frac{a^{l+l'}}{l^2} + \frac{I}{10^6} + j$$

the "I" represents unity and as such is a rather poor choice of notation. In Figure 1 the "D" at the top of the page should be "D'."

* Lux, a unit of illumination equal to one lumen per square meter. The lumen is a unit of luminous flux and is equal to the flux emitted in a unit solid angle by a point source of one candle-power. A uniform source of one candle-power emits 4π lumens.

In concluding this review it should be mentioned that this work is but another tribute to the wide influence and genius of Professor A. Blondel. Congratulations should be extended to Professor A. Blondel for inspiring the book, to M. Jean Rey for writing the book, and to Mr. J. H. Johnson for translating the book. L. A. D.

"America's Case against Germany." By Lindsay Rogers, Ph. D., LL. B., Adjunct Professor of Political Science in the University of Virginia. $1.50. (New York: E. P. Dutton & Company.)

Mr. Rogers in his preface characterizes his work as an attempt "to describe the origin and development of the controversy which was the immediate cause of war between the United States and Germany." His subject is handled in a most scholarly way. This is especially evinced in his admirable use of a most difficult device—the selection and presentation of extracts from diplomatic exchanges, cleverly connected with a rapid summary of the not so important intervening parts, and adequately rounded out through a skilful use of footnotes. His treatment of the subject is most impartial, though at the end he strongly discloses his real sentiments.

These characteristics mark his book throughout as the work of an impartial student, who is thoroughly versed in the subject under discussion and who does not hesitate to point out in unmistakable terms wherein both parties to the "case" were weak in their contentions, policies and diplomatic skill, although his account is "narrative and explanatory, not critical or defensive." The points of the controversy are brought out very clearly, though a more liberal use of the dates of the year would aid the progressive correlation of the diplomatic exchanges.

The addition of an index and an appendix containing the address of President Wilson to Congress, April 2, 1917, and a list of "submarine outrages, which have directly affected American interests, makes the book in every way an invaluable reference work.

Mr. Rogers first takes up the elucidation of certain fundamental problems which are "bound up" with the central issue: "The right to use submarines against merchant vessels." In the "war zone" and German submarine "blockade" discussion, which follows, there is pointed out, in the German reply to Secretary Bryan's "identic" note of February 20, 1915, the remarkable statement that merchant ships should abstain "from arming themselves and from all resistance by force, since such procedure, contrary to international law, *would render impossible any action of the submarines in accordance with international law.* These words which I have italicized," says Mr. Rogers, "would seem to admit absolutely the American contention that it was illegal to sink merchant vessels without warning. But the United States apparently took no advantage of the admission thus made." On the other hand, the reply of Great Britain, to the same note, quoted both Bismarck and Caprivi to show that the British "stoppage" of "foodstuffs destined for the civil population" "presumably is not repugnant to German morality."

The author then clears the way for the proper understanding of the description of the *Lusitania* and "other outrages" and the resultant German pledges, by the lucid presentation of certain "points" of international law, "which were involved" in the preliminary exchanges. He points out how England extended international law after her refusal to adopt the Declaration of London; how "changed circumstances" "easy means of transportation" and Germany's governmental control of all available food resources—made the distinction between conditional and absolute contraband "largely illusory"; how the British Orders in Council ignored this "illusory" distinction and extended the Anglo-American doctrine of continuous voyage; how "the power of the British Navy was used practically to license commerce" between the United States and the northern European neutrals; and, finally, how Germany claimed that the "British extensions of international law" gave her "license to retaliate by submarine warfare."

In the description of the actual infringements of American rights, particular attention is called to the fact that the position—"that submarines should not be used against commerce at all"—which was taken by President Wilson in the first *Lusitania* protest, was "abandoned in later exchanges," though again reverted to in his first *Sussex* note. The injection into the "diplomatic exchanges," of the German objection to the American "trade in munitions of war," Mr. Rogers suggests, was an attempt "to coerce the United States into a position which would illegally operate to the detriment of the Allies, with the alternative, for refusal, of an inhuman and illegal disregard for the lives of all noncombatants—neutral as well as enemy—on the high seas." And the attitude of the State Department in advising the Bethlehem Steel Company not to ship knock-down submarines to England was considered by "a good many able international lawyers too far advanced."

The announcement by Germany that, after March 1, 1916, all armed merchantmen would be sunk "without warning," graphically declares Mr. Rogers, "wiped out her repeated pledges, vitiated the *Lusitania* agreement, and reopened the whole submarine controversy." But the diplomatic position of the United States had been weakened by the suggested "*modus vivendi*" (January, 1916), of Secretary Lansing, who proposed "that the practice of arming merchant vessels be abolished" and that "an enemy merchant vessel when ordered to do so by a belligerent submarine should immediately stop," though "he had himself signed the note of November 7 which upheld the right of a merchantman to resist capture."

After March 1, however, the "submarine activities" were still "indiscriminate and were not confined to merchantmen that carried armament." The Imperial German Government were asked "as to their responsibility for the sinking of the *Englishman*, the *Manchester Engineer*, the *Eagle Point*, and the *Berwindale*, all of which had Americans on board." But," continues Mr. Rogers, "the crowning outrage came on March 24 when the channel steamer *Sussex*, an unarmed passenger boat, was sunk without warning." Again Germany promised future good behavior, although conditionally upon the success of the United States in having "the laws of

humanity followed by all belligerent nations." "In spite of the isolated cases of sinkings," remarks Mr. Rogers, "it was generally thought that Germany still stood by her pledges." In the "meanwhile," however, came the "peace proposals which obscured, in the popular mind at least, all thoughts of the submarine warfare." The effect, however, of President Wilson's address to the United States Senate, January 22, 1915, was just the opposite of that desired. The reply of the Imperial German Government, in their now famous "Declaration," January 31, 1917, "came as a thunderbolt."

"After the break in diplomatic relations every phase of Germany's activities showed that she was unwilling to yield and would insist upon carrying out the program which she had announced"—the sinking of "all ships" in "a zone around Great Britain, France, Italy, and in the eastern Mediterranean."

"Armed neutrality was inadequate," and Senator Stone represented a good deal more than his own opinion, as "there has seemed to be a curious mental vacuity on the justice of the assertion that the crew of a munition ship have rights identical with those of a passenger liner," while "on the other hand, wanton acts like the sinking of the *Lusitania* and the *Laconia* appealed to the people as justifying war by the United States."

In the most interesting concluding chapter, "the lack of justification for reprisals like those of Germany, and the apparent lenience with which the United States has treated the British interference with our trade" are excellently discussed. In the words of Mr. Munro Smith—that "the taking of life is no proper retaliation for the taking of goods," pertinently points out Mr. Rogers, "we find the answer to the argument that we have treated England more leniently than Germany." And the German "disregard" of the "distinction" between combatants and noncombatants "is the real cause of our answering her with acts and not words."

"Perhaps Woodrow Wilson waited wisely until the issue had been made translucently clear—until the liberalization of Russia removed the only anomaly and made the battle one of free nations against a would-be assassin of humanity, democracy, and the future peace of the world." H. F. S.

"Naval Electricians' Text Book, Volume II." Bullard. Revised by officers and instructors of the Department of Electrical Engineering and Physics, U. S. Naval Academy. 520 pages, 299 illustrations, cloth. $3.75. (U. S. Naval Institute.)

In this revision of the Naval Electricans' Text Book, Volume II, Practical, the book has been very largely rewritten. Considerable new matter has been incorporated into the text, particularly regarding search-lights, electric ship propulsion, and electrical equipment of submarines. The entire subject matter has been revised and the description of obsolete equipment omitted, while the more important equipment, such as motors and their appliances, has been brought up to date and enlarged upon. The method of treating the subject of interior communication has also been improved, the subject having been divided into three groups—interior communication, telephone systems, and fire-control systems.

In general, the plan of the original book has been followed in that only practical applications of electricity on board naval vessels have been covered, but it has been very much improved by the omission of a great many details that vary so rapidly as to make it impossible to keep them up to date. This should make the book more satisfactory for use as a text book. S. M. R.

NOTICE

The U. S. Naval Institute was established in 1873, having for its object the advancement of professional and scientific knowledge in the Navy. It is now in its forty-fourth year of existence, trusting as heretofore for its support to the officers and friends of the Navy. The members of the Board of Control cordially invite the co-operation and aid of their brother officers and others interested in the Navy, in furtherance of the aims of the Institute, by the contribution of papers and communications upon subjects of interest to the naval profession, as well as by personal support and influence.

On the subject of membership the Constitution reads as follows:

ARTICLE VII

Sec. 1. The Institute shall consist of regular, life, honorary and associate members.

Sec. 2. Officers of the Navy, Marine Corps, and all civil officers attached to the Naval Service, shall be entitled to become regular or life members, without ballot, on payment of dues or fees to the Secretary and Treasurer. Members who resign from the Navy subsequent to joining the Institute will be regarded as belonging to the class described in this Section.

Sec. 3. The Prize Essayist of each year shall be a life member without payment of fee.

Sec. 4. Honorary members shall be selected from distinguished Naval and Military Officers, and from eminent men of learning in civil life. The Secretary of the Navy shall be, *ex officio*, an honorary member. Their number shall not exceed thirty (30). Nominations for honorary members must be favorably reported by the Board of Control, and a vote equal to one-half the number of regular and life members, given by proxy or presence, shall be cast, a majority electing.

Sec. 5. Associate members shall be elected from Officers of the Army, Revenue Cutter Service, foreign officers of the Naval and Military professions, and from persons in civil life who may be interested in the purposes of the Institute.

Sec. 6. Those entitled to become associate members may be elected life members, provided that the number not officially connected with the Navy and Marine Corps shall not at any time exceed one hundred (100).

Sec. 7. Associate members and life members, other than those entitled to regular membership, shall be elected as follows: "Nominations shall be made in writing to the Secretary and Treasurer, with the name of the member making them, and such nominations shall be submitted to the Board of Control, and, if their report be favorable, the Secretary and Treasurer shall make known the result at the next meeting of the Institute, and a vote shall then be taken, a majority of votes cast by members present electing."

Sec. 8. The annual dues for regular and associate members shall be two dollars, all of which shall be for a year's subscription to the UNITED STATES NAVAL INSTITUTE PROCEEDINGS, payable upon joining the Institute, and upon the first day of each succeeding January. The fee for life membership shall be thirty dollars, but if any regular or associate member has paid his dues for the year in which he wishes to be transferred to life membership, or has paid his dues for any future year or years, the amount so paid shall be deducted from the fee for life membership.

ARTICLE X

Sec. 2. One copy of the PROCEEDINGS, when published, shall be furnished to each regular and associate member (in return for dues paid), to each life member (in return for life membership fee paid), to honorary members, to each corresponding society of the Institute, and to such libraries and periodicals as may be determined upon by the Board of Control.

The PROCEEDINGS are published monthly; subscription for non-members, $3.00; enlisted men, U. S. Navy, $2.00. Single copies, by purchase, 30 cents; issues preceding January, 1917, 50 cents.

All letters should be addressed U. S. Naval Institute, Annapolis, Md., and all checks, drafts, and money orders should be made payable to the same.

SPECIAL NOTICE

NAVAL INSTITUTE PRIZE ESSAY, 1918

A prize of two hundred dollars, with a gold medal, and a life-membership (unless the author is already a life member) in the Institute, is offered by the Naval Institute for the best essay presented on any subject pertaining to the naval profession.

On the opposite page are given suggested topics. Essays are not limited to these topics and no additional weight will be given an essay in awarding the prize because it is written on one of these suggested topics over one written on any subject pertaining to the naval profession.

The following rules will govern this competition:

1. The award for the prize will be made by the Board of Control, voting by ballot and without knowledge of the names of the competitors.

2. Each competitor to send his essay in a sealed envelope to the Secretary and Treasurer on or before January 1, 1918. The name of the writer shall not be given in this envelope, but instead thereof a motto. Accompanying the essay a separate sealed envelope will be sent to the Secretary and Treasurer, with the motto on the outside and writer's name and motto inside. This envelope is not to be opened until after the decision of the Board.

3. The successful essay to be published in the PROCEEDINGS of the Institute; and the essays of other competitors, receiving honorable mention, to be published also, at the discretion of the Board of Control; and no change shall be made in the text of any competitive essay, published in the PROCEEDINGS of the Institute, after it leaves the hands of the Board.

4. If, in the opinion of the Board of Control, the best essay presented is not of sufficient merit to be awarded the prize, it may receive "Honorable Mention" or such other distinction as the Board may decide.

5. In case one or more essays receive "Honorable Mention," the writers thereof will receive a minimum prize of seventy-five dollars and a life-membership (unless the author is already a life member) in the Institute, the actual amounts of the awards to be decided by the Board of Control in each case.

6. An essay not having received honorable mention may be published also, at the discretion of the Board of Control, but only with the consent of the author.

7. The essay is limited to fifty (50) printed pages in the PROCEEDINGS of the Institute.

8. It is requested that all essays be submitted typewritten and in duplicate, if practicable; essays submitted written in longhand and in single copy will, however, receive equal consideration.

9. In the event of the prize being awarded to the winner of a previous year, a gold clasp, suitably engraved, will be given in lieu of the gold medal.

By direction of the Board of Control.

J. W. GREENSLADE,
Commander, U. S. N., Secretary and Treasurer.

PRIZE ESSAY TOPICS

SUGGESTED AT THE INVITATION OF THE BOARD OF CONTROL

BY

THE PRESIDENT OF THE NAVAL INSTITUTE, THE SUPERINTENDENT OF THE NAVAL ACADEMY, THE PRESIDENT OF THE NAVAL WAR COLLEGE, AND THE COMMANDERS-IN-CHIEF OF THE ATLANTIC, PACIFIC AND ASIATIC FLEETS.

"The Mutual Relations of Gunnery and Tactics."

"The Place of the Naval Officer in International Affairs."

"The Evolution of Naval Doctrine from National Character."

"The Training of Enlisted Personnel to Produce Modern Man-o'-Warsmen: (a) Military Training; (b) Moral Training; (c) Education."

"The Organization, Employment and Training of Reserve Fleets and Flotillas."

LIST OF PRIZE ESSAYS

"WHAT THE NAVY HAS BEEN THINKING ABOUT"

1879

Naval Education. Prize Essay, 1879. By Lieut. Commander A. D. Brown, U. S. N.

NAVAL EDUCATION. First Honorable Mention. By Lieut. Commander C. F. Goodrich, U. S. N.

NAVAL EDUCATION. Second Honorable Mention. By Commander A. T. Mahan, U. S. N.

1880

"The Naval Policy of the United States." Prize Essay, 1880. By Lieutenant Charles Belknap, U. S. N.

1881

The Type of (I) Armored Vessel, (II) Cruiser Best Suited to the Present Needs of the United States. Prize Essay, 1881. By Lieutenant E. W. Very, U. S. N.

SECOND PRIZE ESSAY, 1881. By Lieutenant Seaton Schroeder, U. S. N.

1882

Our Merchant Marine: The Causes of Its Decline and the Means to Be Taken for Its Revival. "Nil clarius aquis." Prize Essay, 1882. By Lieutenant J. D. Kelley, U. S. N.

"MAIS IL FAUT CULTIVER NOTRE JARDIN." Honorable Mention. By Master C. G. Calkins, U. S. N.

"SPERO MELIORA." Honorable Mention. By Lieut. Commander F. E. Chadwick, U. S. N.

"CAUSA LATET: VIS EST NOTISSIMA." Honorable Mention. By Lieutenant R. Wainwright, U. S. N.

1883

How May the Sphere of Usefulness of Naval Officers Be Extended in Time of Peace with Advantage to the Country and the Naval Service? "Pour encourager les Autres." Prize Essay, 1883. By Lieutenant Carlos G. Calkins, U. S. N.

"SEMPER PARATUS." First Honorable Mention. By Commander N. H. Farquhar, U. S. N.

"CULIBET IN ARTE SUA CREDENDUM EST." Second Honorable Mention. By Captain A. P. Cooke, U. S. N.

1884

The Reconstruction and Increase of the Navy. Prize Essay, 1884. By Ensign W. I. Chambers, U. S. N.

1885

Inducements for Retaining Trained Seamen in the Navy, and Best System of Rewards for Long and Faithful Service. Prize Essay, 1885. By Commander N. H. Farquhar, U. S. N.

1886

What Changes in Organization and Drill Are Necessary to Sail and Fight Effectively Our Warships of Latest Type? "Scire quod nescias." Prize Essay, 1886. By Lieutenant Carlos G. Calkins, U. S. N.

THE RESULT OF ALL NAVAL ADMINISTRATION AND EFFORTS FINDS ITS EXPRESSION IN GOOD ORGANIZATION AND THOROUGH DRILL ON BOARD OF SUITABLE SHIPS. Honorable Mention. By Ensign W. L. Rodgers, U. S. N.

1887

The Naval Brigade: Its Organization, Equipment and Tactics. "In hoc signo vinces." Prize Essay, 1887. By Lieutenant C. T. Hutchins.

1888

Torpedoes. Prize Essay, 1888. By Lieut. Commander W. W. Reisinger, U. S. N.

1891

The Enlistment, Training and Organization of Crews for Our Ships of War. Prize Essay, 1891. By Ensign A. P. Niblack, U. S. N.

DISPOSITION AND EMPLOYMENT OF THE FLEET: SHIP AND SQUADRON DRILL. Honorable Mention, 1891. By Lieutenant R. C. Smith, U. S. N.

1892

Torpedo-boats: Their Organization and Conduct. Prize Essay, 1892. By Wm. Laird Clowes.

1894

The U. S. S. Vesuvius, with Special Reference to Her Pneumatic Battery. Prize Essay, 1894. By Lieut. Commander Seaton Schroeder, U. S. N.

NAVAL REFORM. Honorable Mention, 1894. By Passed Assistant Engineer F. M. Bennett, U. S. N.

1895

Tactical Problems in Naval Warfare. Prize Essay, 1895. By Lieut. Commander Richard Wainwright, U. S. N.

A SUMMARY OF THE SITUATION AND OUTLOOK IN EUROPE. An Introduction to the Study of Coming War. Honorable Mention, 1895. By Richmond Pearson Hobson, Assistant Naval Constructor, U. S. N.

SUGGESTIONS FOR INCREASING THE EFFICIENCY OF OUR NEW SHIPS. Honorable Mention, 1895. By Naval Constructor Wm. J. Baxter, U. S. N.

THE BATTLE OF THE YALU. Honorable Mention, 1895. By Ensign Frank Marble, U. S. N.

1896

The Tactics of Ships in the Line of Battle. Prize Essay, 1896. By Lieutenant A. P. Niblack, U. S. N.

THE ORGANIZATION, TRAINING AND DISCIPLINE OF THE NAVY PERSONNEL AS VIEWED FROM THE SHIP. Honorable Mention, 1896. By Lieutenant Wm. F. Fullam, U. S. N.

NAVAL APPRENTICES, INDUCEMENTS, ENLISTING AND TRAINING. The Seaman Branch of the Navy. Honorable Mention, 1896. By Ensign Ryland D. Tisdale, U. S. N.

THE COMPOSITION OF THE FLEET. Honorable Mention, 1896. By Lieutenant John M. Ellicott, U. S. N.

1897

Torpedo-boat Policy. Prize Essay, 1897. By Lieutenant R. C. Smith, U. S. N.

A PROPOSED UNIFORM COURSE OF INSTRUCTION FOR THE NAVAL MILITIA. Honorable Mention, 1897. By H. G. Dohrman, Associate Member, U. S. N. I.

TORPEDOES IN EXERCISE AND BATTLE. Honorable Mention, 1897. By Lieutenant J. M. Ellicott, U. S. N.

1898

Esprit de Corps: A Tract for the Times. Prize Essay, 1898. By Captain Caspar Frederick Goodrich, U. S. N.

OUR NAVAL POWER. Honorable Mention, 1898. By Lieut. Commander Richard Wainwright, U. S. N.

TARGET PRACTICE AND THE TRAINING OF GUN CAPTAINS. Honorable Mention, 1898. By Ensign R. H. Jackson, U. S. N.

1900

Torpedo Craft: Types and Employment. Prize Essay, 1900. By Lieutenant R. H. Jackson, U. S. N.

THE AUTOMOBILE TORPEDO AND ITS USES. Honorable Mention, 1900. By Lieutenant L. H. Chandler, U. S. N.

1901

Naval Administration and Organization. Prize Essay, 1901. By Lieutenant John Hood, U. S. N.

1903

Gunnery in Our Navy. The Causes of Its Inferiority and Their Remedies. Prize Essay, 1903. By Professor Philip R. Alger, U. S. N.

A NAVAL TRAINING POLICY AND SYSTEM. Honorable Mention, 1903. By Lieutenant James H. Reid, U. S. N.

SYSTEMATIC TRAINING OF THE ENLISTED PERSONNEL OF THE NAVY. Honorable Mention, 1903. By Lieutenant C. L. Hussey, U. S. N.

OUR TORPEDO-BOAT FLOTILLA. The Training Needed to Insure Its Efficiency. Honorable Mention, 1903. By Lieutenant E. L. Beach, U. S. N.

1904

The Fleet and Its Personnel. Prize Essay, 1904. By Lieutenant S. P. Fullinwider, U. S. N.

A PLEA FOR A HIGHER PHYSICAL, MORAL AND INTELLECTUAL STANDARD OF THE PERSONNEL FOR THE NAVY. Honorable Mention, 1904. By Medical Inspector Howard E. Ames, U. S. N.

1905

American Naval Policy. Prize Essay, 1905. By Commander Bradley A. Fiske, U. S. N.

THE DEPARTMENT OF THE NAVY. Honorable Mention, 1905. By Rear Admiral Stephen B. Luce, U. S. N.

1906

Promotion by Selection. Prize Essay, 1906. By Commander Hawley O. Rittenhouse, U. S. N.

THE ELEMENTS OF FLEET TACTICS. First Honorable Mention, 1906. By Lieut. Commander A. P. Niblack, U. S. N.

GLEANINGS FROM THE SEA OF JAPAN. Second Honorable Mention, 1906. By Captain Seaton Schroeder, U. S. N.

THE PURCHASE SYSTEM OF THE NAVY. Third Honorable Mention, 1906. By Pay Inspector J. A. Mudd, U. S. N.

1907

Storekeeping at the Navy Yards. Prize Essay, 1907. By Pay Inspector John A. Mudd, U. S. N.

BATTLE REHEARSALS. A Few Thoughts on Our Next Step in Fleet-Gunnery. First Honorable Mention, 1907. By Lieut. Commander Yates Stirling, U. S. N.

THE NAVAL PROFESSION. Second Honorable Mention, 1907. By Commander Bradley A. Fiske, U. S. N.

1908

A Few Hints to the Study of Naval Tactics. Prize Essay, 1908. By Lieutenant W. S. Pye, U. S. N.

THE MONEY FOR THE NAVY. First Honorable Mention, 1908. By Pay Inspector John A. Mudd, U. S. N.

THE NATION'S DEFENCE—THE OFFENSIVE FLEET. How Shall We Prepare It for Battle? Second Honorable Mention, 1908. By Lieut. Commander Yates Stirling, U. S. N.

1909

Some Ideas about Organization on Board Ship. Prize Essay, 1909. By Lieutenant Ernest J. King, U. S. N.

THE NAVY AND COAST DEFENCE. Honorable Mention, 1909. By Commodore W. H. Beehler, U. S. N.

THE REORGANIZATION OF THE NAVAL ESTABLISHMENT. Honorable Mention, 1909. By Pay Inspector J. A. Mudd, U. S. N.

A PLEA FOR PHYSICAL TRAINING IN THE NAVY. Honorable Mention, 1909. By Commander A. P. Niblack, U. S. N.

1910

The Merchant Marine and the Navy. Prize Essay, 1910. By Naval Constructor T. G. Roberts, U. S. N.

THE NAVAL STRATEGY OF THE RUSSO-JAPANESE WAR. Honorable Mention, 1910. By Lieutenant Lyman A. Cotton, U. S. N.

1911

Navy Yard Economy. Prize Essay, 1911. By Paymaster Charles Conard, U. S. N.

NAVAL POWER. Honorable Mention, 1911. By Captain Bradley A. Fiske, U. S. N.

WANTED—FIRST AID. Honorable Mention, 1911. By Commander C. C. Marsh, U. S. N.

1912

Naval Might. Prize Essay, 1912. By Lieutenant Ridgely Hunt, U. S. N. (retired).

INSPECTION DUTY AT THE NAVY YARDS. Honorable Mention, 1912. By Lieut. Commander T. D. Parker, U. S. N.

1913

The Greatest Need of the Atlantic Fleet. Prize Essay, 1913. By Lieut. Commander Harry E. Yarnell, U. S. N.

NAVY DEPARTMENT ORGANIZATION. A Study of Principles. First Honorable Mention, 1913. By Commander Yates Stirling, Jr., U. S. N.

TRAINED INITIATIVE AND UNITY OF ACTION. Second Honorable Mention, 1913. By Lieut. Commander Dudley W. Knox, U. S. N.

1914

The Great Lesson from Nelson for To-day. Prize Essay, 1914. By Lieut. Commander Dudley W. Knox, U. S. N.

NAVAL POLICY AS IT RELATES TO THE SHORE ESTABLISHMENT AND THE MAINTENANCE OF THE FLEET. Honorable Mention, 1914. By Captain John Hood, U. S. N.

OLD PRINCIPLES AND MODERN APPLICATIONS. Honorable Mention, 1914. By Lieut. Commander Dudley W. Knox, U. S. N.

MILITARY PREPAREDNESS. Honorable Mention, 1914. By Naval Constructor Richard D. Gatewood, U. S. N.

1915

The Rôle of Doctrine in Naval Warfare. Prize Essay, 1915. By Lieut. Commander Dudley W. Knox, U. S. N.

AN AIR FLEET: OUR PRESSING NAVAL WANT. First Honorable Mention, 1915. By Lieut. Commander Thomas Drayton Parker, U. S. N.

TACTICS. Second Honorable Mention, 1915. By Ensign H. H. Frost, U. S. N.

DEFENCE AGAINST SURPRISE TORPEDO ATTACK. Third Honorable Mention, 1915. By Ensign R. T. Merrill, 2d, U. S. N.

1916

The Moral Factor in War. Prize Essay, 1916. By Lieutenant (J. G.) H. H. Frost, U. S. N.

NAVAL PERSONNEL. First Honorable Mention, 1916. By Lieut. Commander J. K. Taussig, U. S. N.

EDUCATION AT THE U. S. NAVAL ACADEMY. Second Honorable Mention, 1916. By Lieutenant Ridgely Hunt, U. S. N.

SOME UNDERLYING PRINCIPLES OF MORALE. Third Honorable Mention, 1916. By Commander Dudley W. Knox, U. S. N.

LARGE *vs.* A GREATER NUMBER OF SMALLER BATTLESHIPS. Lippincott Prize Essay. By Lieut. Commander Thomas Lee Johnson, U. S. N.

1917

Commerce Destroying in War. Prize Essay, 1917. By Commander Lyman A. Cotten, U. S. Navy.

THE PEOPLE'S RÔLE IN WAR. First Honorable Mention, 1917. By Lieutenant H. H. Frost, U. S. Navy.

THE NATION'S GREATEST NEED. Second Honorable Mention, 1917. By Colonel Dion Williams, U. S. Marine Corps.